



# The Connected Enterprise - A world of possibilities

**KPMG Point of View**

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# KPMG in India foreword

Emerging technologies are reshaping businesses and have emerged as a key disruptor of our times. Digital is providing breakthrough capabilities at all levels of value chain and there is no ambiguity that we are living in the age of digital disruption with digital technologies not only redefining the business models but also how organizations operate. With the advancement in connectivity and cloud / edge computing, new use cases enabled by AI / ML, IoT, Robotics and AR / VR have found widespread mainstream adoption. This transformation will be further accelerated with 5G adoption.

KPMG in India is pleased to present their Point of View on Connected Enterprises and its implications on businesses and imperatives for telecom companies. The document assesses constructs of a connected enterprise and how confluence of technologies is enabling its rise. Any connected enterprise can be deconstructed into different layers basis the scale and scope of digitally enabled activities. Taking a bottoms-up approach, we can see that smart components give rise to connected processes which create connected functions and ultimately a connected enterprise. Digital maturity and capability enable organizations to operate at different levels of this connected model. Even though the digital disruptors have proven their differentiated value add, it is the confluence of these technologies, when used in unison, that gives rise to a connected

enterprise in true sense. In this document, we will also see how these technologies are creating use cases in the value chain of few business sectors

Connectivity forms a key enabler for achieving enterprise digital connectivity. Widespread deployment of 4G connectivity accelerated the connected journey for businesses, but it is the upcoming 5G, that will unlock massive value. With ultra-fast speed and low latency, 5G will be able to provide the much-needed network capabilities required to push these digital initiatives to be implemented at scale over the enterprise and deliver a connected enterprise in true sense. This is a big moment for telcos who have already witnessed the first wave of connected tech transformation though 4G enterprises. B2B benefits of 5G are perceived to outshine the B2C which brings a new dimension to telecom's strategy

Conventionally telcos have been perceived as a connectivity enabler, however 5G will be a crucial moment as telecom industry looks to add new capabilities and services to enterprises and emerge as a strategic partner. As India begins its 5G trials, futuristic growth areas are indeed promising for the telecom industry – but competing in the digitally connect environment will require a new DNA, a DNA focusing on creating value for customers beyond connectivity.



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# Executive Summary:

Enterprises around the globe are seeking opportunities to accelerate their business operations through adoption of new-age digital technologies for coping with the dynamic market conditions. Technologies such as artificial intelligence, cognitive deep learning, autonomous machines and big data analytics are enabling companies to make the leap to smart, data-driven flexible, agile and connected operations. While digital transformation is need of the hour, it is completely impossible to achieve this without high speed, high bandwidth, secure and ultra-low latency network connectivity. With the advent of 5G connectivity and AI-enabled cognitive edge computing, the aspiration can be

transformed into reality serving all the requirements of a connected enterprise. Telecom service providers have a vital role to play in the entire ecosystem as key enablers to connected enterprise.

This point of view thus chalks out the constructs of a connected enterprise, key capabilities, enablers and benefits, realisation of connected enterprise in various industrial verticals. It also anchors the connected ecosystem and explores the opportunities telcos (Telcom service providers) have in the connected world and how they can play a bigger role and not only enable the transformation but also become a critical partner to business offerings. The report identifies strategic choices for telcos.





# 5G



# Building blocks for a typical Connected Enterprise?

From a vantage point, Connected Enterprise may appear as an over-arching theme, where front, middle and back offices of the enterprise are connected by a mesh of digital fabric. However, to be able to achieve such a state, an enterprise must be digitally connected at four sub-layers.

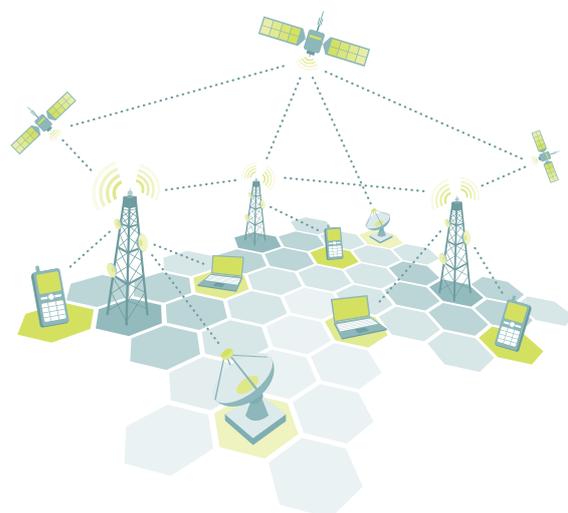
**1. Layer 1 - Connected Components:** This level forms the core of a Connected Enterprise. Component here represents the smallest entity operating at the ground level that drives the larger functions. Based on the industry segment, components could be parts, machines, sub-assemblies, individuals, special purpose devices etc. Connected Components can describe their operating and health condition, coordinating with other components for predictive, adaptive, and autonomous operations. Organisations can transform existing components into connected through sensorisation and digitisation, basis the component type and its existing interactions with the surrounding. An underlying layer of connected components forms the foundation for the entire stack.

**2. Layer 2 - Connected Processes:** An interconnected mesh of connected components collectively delivering predictive, efficient, adaptive and autonomous operations forms a connected process. The manifestation could vary for businesses. For example, a production line in manufacturing organisation which consists of multiple connected machines or a cluster of connected heavy equipment for an Engineering Procurement and Construction (EPC) industry, a connected user onboarding experience in a retail store, smart production and assembly, in-line automated quality inspection and control, smart maintenance, smart inbound and outbound logistics, automated payments, smart worker safety, etc. basis the industrial vertical etc. A connected process facilitates seamless exchange of information across activities and supports multipoint connectivity and can support autonomous work.

**3. Layer 3 - Connected Functions:** Connected components and processes enable digitisation of business functions in the value chain. A connected function can be constituted through connected plants, stores or facilities that may be separated by huge geographical distances. Depending on the industrial vertical, a function could be a network of manufacturing facilities, automated inventory management, a construction project site for EPC, a digital logistics chain, connected wells and refineries, etc. These connected plants or facilities can be managed through centralized connected digital command and control center providing visualisation, actionable and control across the value chain.

**4. Layer 4 - Connected Enterprise:** The highest layer of connected enterprise model is the state which is achieved when an organisation can digitally integrate its business functions and harness data, actionable insights with a real-time understanding of the critical business parameters to shape integrated business decisions. At this stage, the organisation is able to form digital bridges not only within but also with external agents end customers for enhanced visibility, transparency, traceability.

To empower a connected enterprise, a set of key enablers are imperative. These enablers help ensure that the organisation can sustain the digital capability.



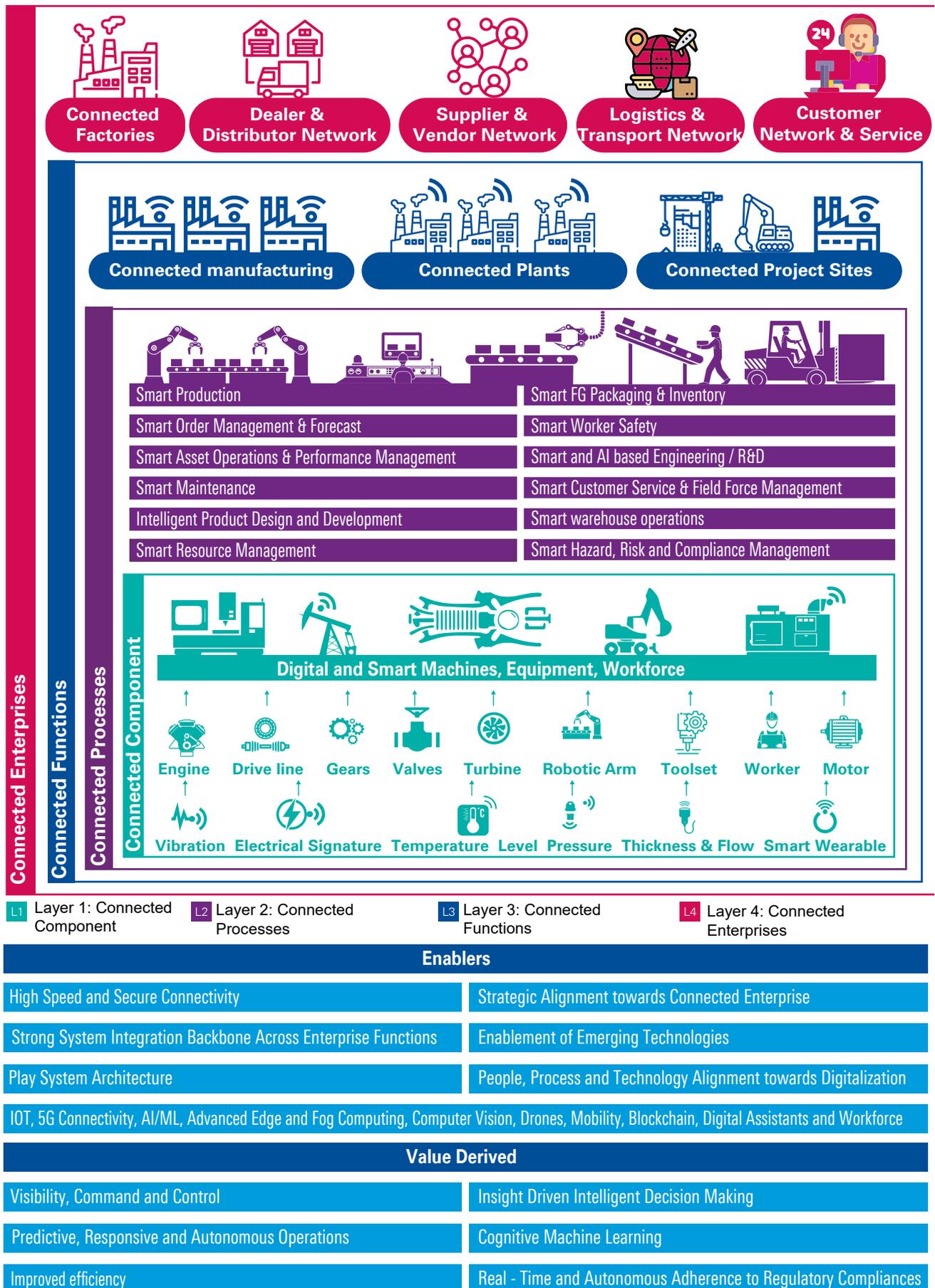


Figure 1 Connected Enterprise

However, specifically in the Indian context where industries are dominated by heterogeneous systems and applications, enterprises struggle to decide which technology needs to be deployed where and how. Elements like how do the various technologies interplay, how do they get deployed and integrated, whether the deployment should be on premise, or on cloud or in an edge environment determining

the related network and security requirements are some of the critical decision making points that the enterprises are grappling with as they embark on their connected journey. Enterprises are increasingly seeking to resolve these issues through collaboration by bringing in expertise relating to technology, analytics, networks and security together to solve their business problems.

## Realising Connected Enterprise in different industries

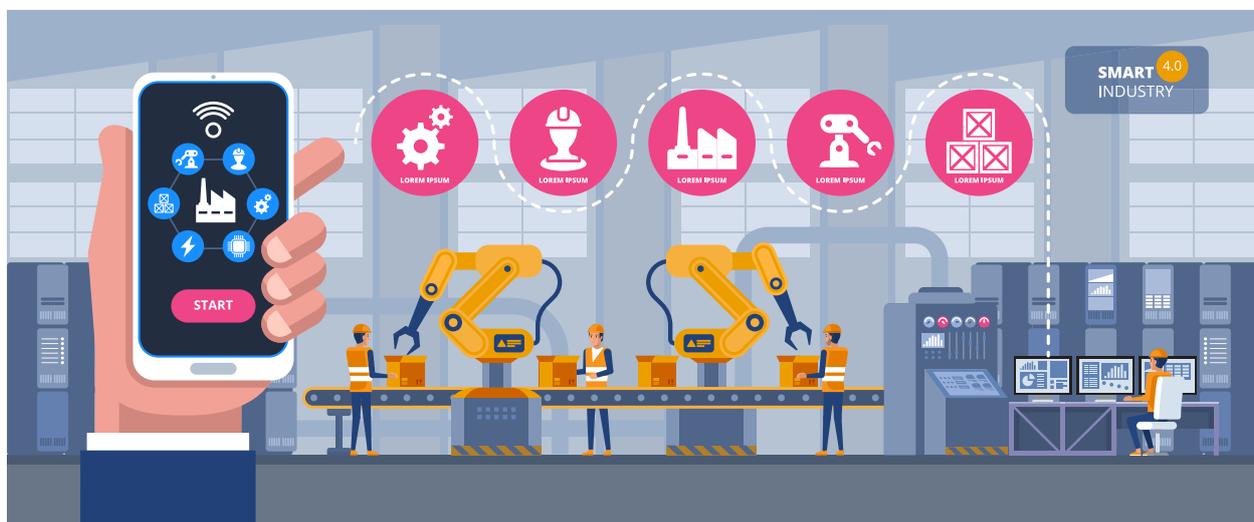
While connected tech instills huge potential and value, effective realisation of potential capabilities remains a challenge. With an in-depth view of

some select industries, we will try to assess the possibilities and how organisations can unlock value.

### Manufacturing

Manufacturing is one of the sectors where connected technologies are expected to create the biggest impact. Amalgamation of connected technologies is enabling enterprises to take a leap towards achieving smart, data driven and highly autonomous factories, where sensors analyze data from every corner and production can be planned dynamically to meet demand. AI enabled intelligent IIoT systems can model data and act without human intervention. Predictive maintenance, critical asset monitoring, real-time environmental awareness, in-line real-time production quality management etc. are among the leading use cases where connected ecosystem

can make a direct difference. The digital enablers of industry 4.0 have now reached the required levels of solution maturity and commercial viability for rapid adoption. 5G network is expected to accelerate this even more. The next set of Industrial Revolution changes would bring mass customisation, personalisation and extending the power of customisation to the end customer, which would require intense and multi-level cooperation between people and machines. Adaptive and additive manufacturing coupled with AI and deep learning, 5G network and edge computing can enable industries to realize this future state.





Connected Enterprises

Connected Functions

Connected Processes

Connected Component



### IOT Devices and Edge Computing

Sensors enable machines and equipment initiating machine to machine communication. 5G connectivity and Edge computing equips manufacturers with greater control over critical processes with ultra-low latency between incident and actionable



### Autonomous Machines, Robots & Vehicles

AI powered advanced edge and fog computing, autonomous operations can be achieved with real-time sensing, ultra-low latency connectivity.



### AR/VR

Enable operators to monitor and manage plant operations, monitor machine health, perform maintenance, take safety measures and trainings by superimposing digital and physical spaces along with system integration for tagging the application information on real-time. Can also simulate numerous combination of environments and possibilities with recommendations



### Smart Worker Safety

Realtime worker health and fatigue parameters can be monitored with smart wearables and capable connectivity. Drones and Computer Vision can enable monitoring of remotely located assets without human intervention, moreover, it can predict unsafe instances where operators can be prone to accidents.



### Digital Twins

Real-time Digital Twins powered with AI, ML and Deep learning along with 5G Network are capable of equipment self healing, intelligent suggestions on design modification, predicting failures and suggesting best time to maintain, provide control and visibility across the operations.



### Factory Performance

Connected factories can enable manufacturing enterprises to have seamless coordination among multiple production facilities for evenly managing the workload and resources, benchmarking performance, production and efficiency.



### Integrated Command and Control Center

An integrated ecosystem of digital applications embedded in the manufacturing value chain and Engineering Applications can enable businesses to have central visibility though command and control.

## Energy and Natural Resource

Due to the nature of work, upstream activities in the sector are usually driven from remote areas far away from robust connectivity. As the activities are sensitive in nature, the level of monitoring required is high and the amount of data generated for activities is huge, which requires ultra-low latency in data sensing and intelligent actionable to prevent any

failure. Due to limitation in transmission of sensor data and processing at offshore sites, connected capability is achieved through high speed, ultra-low latency, high bandwidth network along with AI near the source of data generation. The combination of 5G and AI enabled edge computing along with cognitive deep learning bridges the connectivity gap



### Connected Enterprises

### Connected Functions

### Connected Processes

### Connected Component



#### IOT Devices and Edge Computing

With improved connectivity and Edge computing, organizations can have greater control over monitoring critical parameters at sites and get a real time view of systems.



#### Autonomous Machines, Robots & Vehicles

Geared with real-time sensing, ultra-low latency connectivity, AI powered advanced edge and fog computing and cognitive deep learning, operations at extraction and refining especially the one located remotely, can be made autonomous to delay the failure instances, regulate the production, mitigate risks, etc.



#### AR/VR

AR/VR based learning methods can simulate advanced trainings which can be performed exposing the user to critical and hazardous processes. Moreover, AR can also assist workers during operations and maintenance by ensuring all safety measures are taken.



#### Digital Twins

Real-time Digital Twins powered with AI, ML and Deep learning along with 5G Network are capable of equipment self healing, intelligent suggestions predicting failures and suggesting best time to maintain, provide control and visibility across the operations.



#### Digital Oil Fields & Platforms

Connected Oil Fields and Platforms can enable oil & gas industries to have seamless coordination among producing fields for evenly managing the production load, synchronizing with the demand, benchmarking performance and efficiency. Provides unified view across operations.



#### Connected Value chain

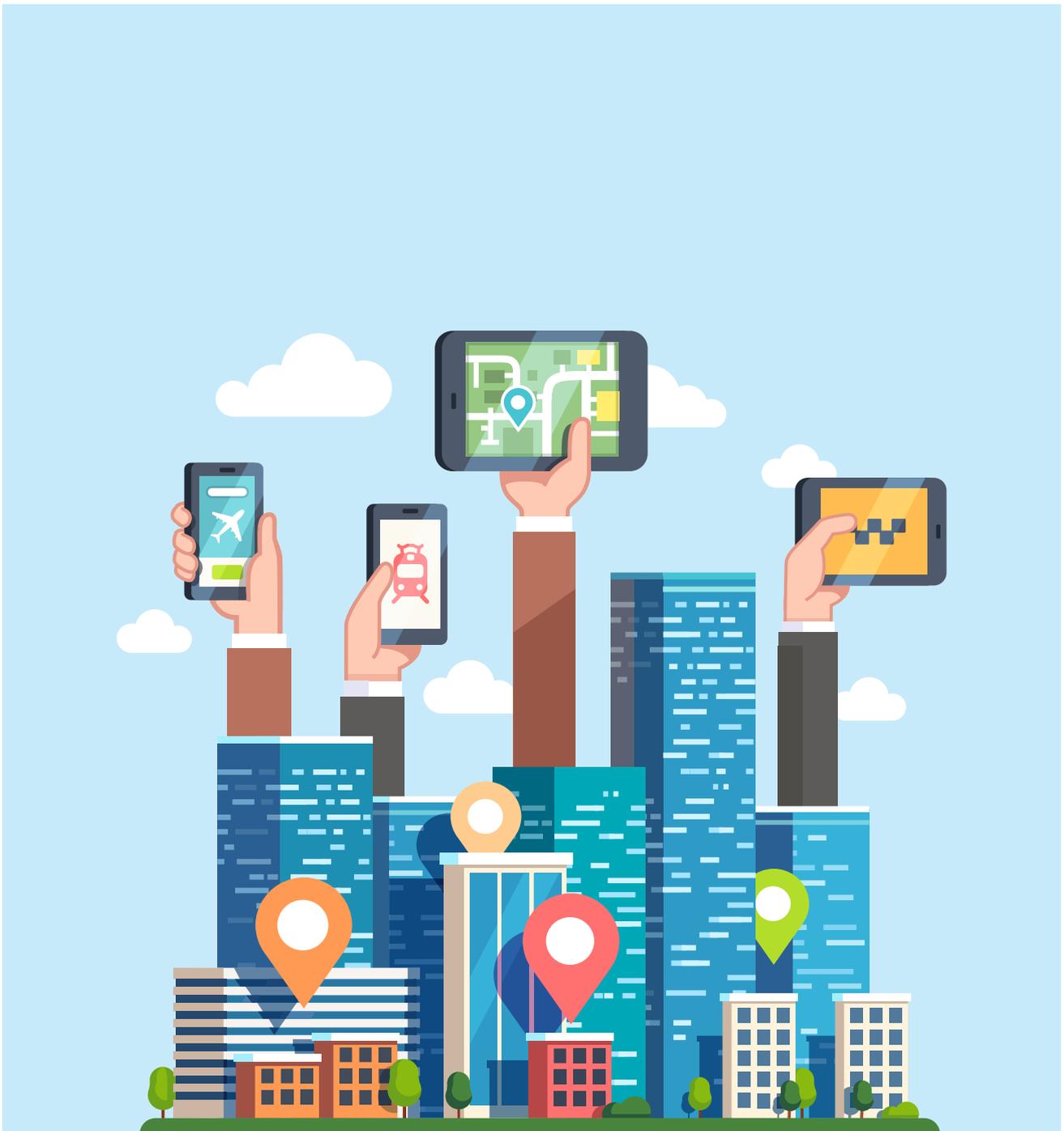
Connected upstream, midstream and downstream including oil fields and offshore platforms, refineries, terminals, depots, retail outlets, B2B customers and the transportation across stages via sea, rail, road and pipelines can enable manufacturing enterprises to effectively plan the production, shutdowns, maintenance, supply chain, sales and other operations.

## Transportation

Transportation and logistics form the intrinsic part of the value chain for almost all the industries. Key barriers for a connected ecosystem for fleet of mobile assets were poor connectivity, high latency, and poor bandwidth for transmitting high volume data points. 5G connectivity can enable transmission of high volumes of data in near real-time.

Intelligent transportation is a key attribute for smart cities with vehicle to infrastructure (V2I) and

Vehicle to Vehicle (V2V) connections emerging as key enablers. Real time tracking of in transit activities can help the businesses to get a view of overall performance and efficiency leaks in the process. Realtime update on congestion, roadworks and accidents can be leveraged for better route optimisation queries. In a hyperconnected transportation chain, autonomous delivery bots can communicate with a variety of public and private infrastructure in real time





Connected Enterprises

Connected Functions

Connected Processes

Connected Component



### IOT Devices and Edge Computing

The interconnected mesh of sensors and smart devices installed on the mediums and modes of transit requires massive density of 5G to function smoothly. Better density of devices and improved latency results in more accurate tracking leading into improved insights and reduced probability of pilferage.

Edge computing plays a vital role in areas with poor network connectivity for providing key insights to the operator of mobile asset and autonomous controls for the asset itself. With 5G+Edge it will be possible to execute advanced rules, dynamically schedule vehicles, and prevent failures, accidents and risks.



### Intelligent Track and Trace

Tracking and tracing the consignment becomes vital for both the end customer and the material supplier. This includes the geo-location tracking, geo-fencing for notifications on scheduling the resources, ETA, route optimization, digital proof of deliveries. Moreover, specific mobile assets have regulatory guidelines for which tracking the driver's driving pattern, over speeding, de-tours, unwanted stoppages, pilferage/theft predictions, etc. becomes important.



### Intelligent Transportation Systems

Holistic enterprise solutions covering entire value chain from inventory, logistics, smart vehicles, toll and ticketing, smart parking, fleet telematics and navigation. 5G + edge is imperative to support the large amount of data produced by these systems during the connected transit.



### V2X Connectivity

5G, IOT, edge computing, AI and cognitive deep learning, unlocks the possibilities of V2X (Vehicle to Everything connectivity) this includes Vehicle to Infrastructure, Vehicle to Vehicle, Vehicle to Pedestrian, Vehicle to Network, Vehicle to other transportation means, etc. Such an ecosystem requires ultra-low latency between the signals sensed and the actionable.



### Blockchain Enabled Transportation

An underlying Blockchain ledger shall provide tamperproof, timestamped and distributed set of records, events, incidents and other key data points across stakeholders in the entire value chain enabling transparency, traceability and visibility. For instance, tracking of cold chain along with the breakage instance and sharing it across regulatory bodies, customers and other stakeholders shall ease root-cause identification, product recalls, resolve disputes, eliminate blame game, reduce counterfeits, improve regulatory compliance, and protect against fraud.



### Integrated systems

5G, edge and AI powered intelligent systems facilitate reliable data collection from multiple sources and model usage through algorithms to identify optimum parameters for activities, introduce new services with sophisticated pricing models.

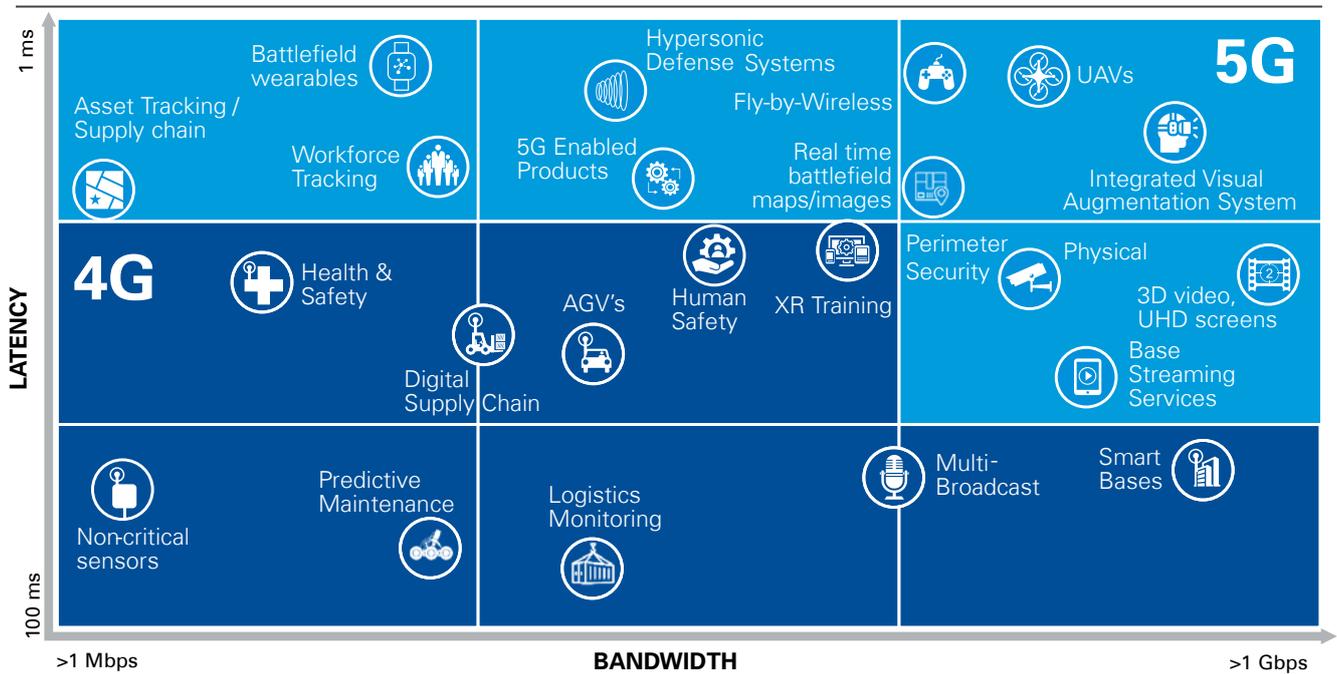
## Role of Telco in Connected Enterprise

Undoubtedly, connectivity is at the forefront of digital disruption. A seamless, reliable and adequately fast connectivity is the backbone of any connected model enabling the vital transfer of data across digital systems. While industries had started to unlock value through digital transformation, the necessity of high speed low latency connectivity was always felt for going beyond the threshold. 4G has shown the potential of what connected solutions can offer. However, it is the next generation 5G connectivity which promises large-scale disruption in the way business activities can be carried out. 5G promises to be transformative and has the potential to harness the true value of Industry 4.0. Through network slicing and private 5G networks, enterprises can enable customisation that will allow them a robust network to deploy different use cases securely.

The connected ecosystem offers more opportunities for telcos than just provide fixed or wireless connectivity. Conventionally telcos have been considered as an enabler in the connected

ecosystem, but now they can emerge as a partner in the pursuit. Connected ecosystem opens opportunities for telcos to partner in developing new services and solutions which can be taken to customers. This may include providing enterprise services on connected capability, developing host of connected enterprise apps for functions, private network for businesses, accelerate in developing autonomous vehicles, enable connected healthcare, IoT connected facilities, deploying closed connected environments for businesses or smart worker solutions, opportunities are immense. The key to realize these opportunities is how telcos can establish their position in the ecosystem to capture maximum value.

Large variety of use cases evolve by leveraging 5G connectivity, emerging technologies and engaging multiple skillsets, that reveals a potential global market of ~ USD 300 Bn with an average CAGR 25per cent per sector.



Source: KPMG Research & Analysis.

The conceptualisation to commercialisation cycle of technology driven initiatives is not short. Telcos need to identify and prioritize their strategic bets and plough resources as spectrum acquisition and modernising network infrastructure will also contribute to increased financial outflow. In competitive and price sensitive markets, retail

customers may be conscious of spending more on merely high-speed connectivity. Incremental revenue from retail operations alone may not be able to cover the high capital expenditure. There are opportunities for telcos to tap into the enterprise solutions space and identify new business avenues for balancing the overall return on investments.



# Sizing up the opportunity

Telcos are at the cusp of a significant change in the industry and well poised to ride the wave of transformation. In order to size up the opportunity, telcos need to identify and align the strategic priorities.

- **Harnessing the core:** Embedding emerging technologies with the core network offerings will result in creating a diversified yet holistic portfolio for telcos for the large customer base they already cater to. They could be in a position to provide end to end connected solutions to businesses with in-a-box deployment approach. Identifying the right field of play is crucial here as they cannot match the capability of Hyperscalers in the market.
- **Partner to pivot:** Connected technology space is filled with large number of use cases to be tapped into which requires depth and breadth in digital capabilities. Collaboration and co-creation are the way forward for telcos to maximize their share of opportunities. Indian telecom space is already hot with signing partnerships with different entities in diverse areas including hardware, services delivery and co-development of products, edge and cloud. The nature and purpose of partnerships here ranges from creating customized hardware for implementing 5G to being a reseller of partner's services. These partnerships need to be elastic, agile and delivery quickly.
- **Imbibing the digital DNA** – with technology becoming ubiquitous, telcos will also be focusing more on bringing technologies led offerings. In a way telcos may be akin to a technology company and therefore may have to act like them. They may need to focus on positioning themselves as a technology company, focus on cutting edge technologies to gain competitive edge, following the model of digital first business and operating model which allows them to chart their own digital transformation agenda.
- **Innovation led transformation:** Pursuit for new value offerings needs to be insight led. Telcos need to tap into pools of internal and external resources for identifying the innovative solutions and business models to pursue. Options emerging from the triad of digital, customer centricity and innovation can be further incubated and explored for feasibility and variability.

# Conclusion

The present new-normal which has arisen due to dynamic business scenario has forced enterprises across the world to take on a major digital transformation. Connectivity as a result becomes critical in terms of providing collaboration opportunities while boosting organisational resilience. Beyond just an enabler of connectivity, the future value of telecom lies in providing value-oriented services and customized experiences, leading to innovative operating, service and delivery models. Technologies like 5G, Industrial IoT, Drones,

Augmented Reality/Virtual Reality (AR/ VR), Artificial Intelligence (AI) and Machine Learning, Edge and Fog computing, etc. promise to transform connectivity for providing better and secure personalized experiences.

The deployment of 5G and connected technologies will disrupt our day-to-day lives and transform sectors with an array of interconnected ecosystem, to provide significant opportunities for telecoms across the value chain and spur the adoption of lighter and effective business operating models.

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