



The Internet of Things: Revolution in the making

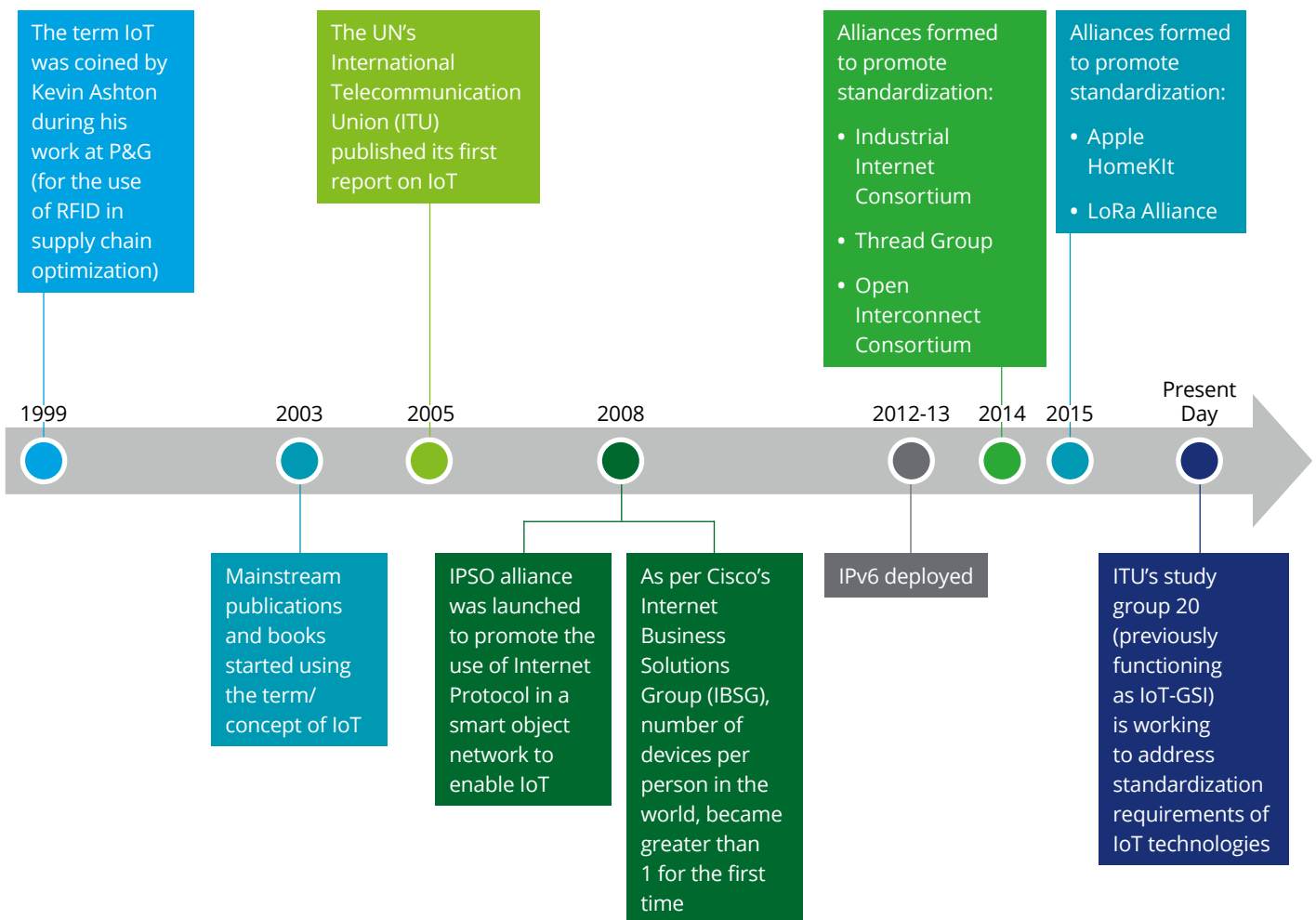
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Internet of Things (IoT): Revolution in the Making

The concept of Internet of Things has gained significant traction over the last decade, owing to collective efforts by industry players, associations as well as academia. Various consortiums of corporates as well as industry associations such as IPSO alliance, IIC (Industrial Internet Consortium), OIC (Open Interconnect Consortium) etc.

have been working towards increasing worldwide IoT awareness and adoption. Increasing number of devices connected to the internet has played a significant role in driving IoT adoption. Academia in collaboration with other industry stakeholders has further supported development and deployment of IoT solutions

Evolution of IoT and its standards



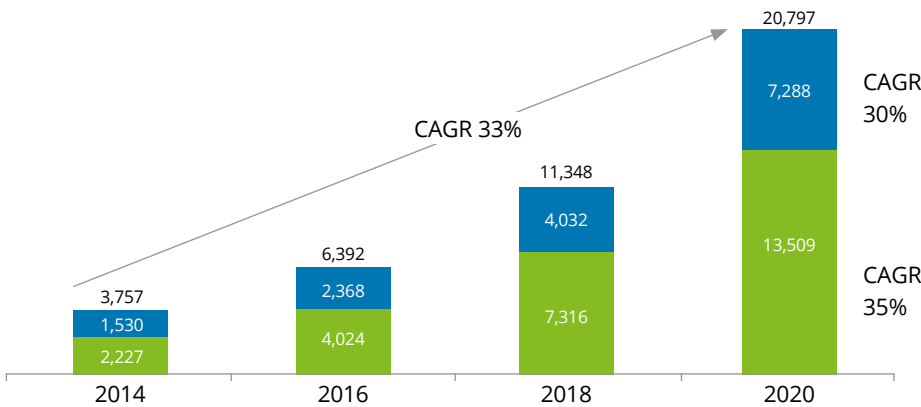
Source: Industry reports, Articles

Key Global and India Market Trends

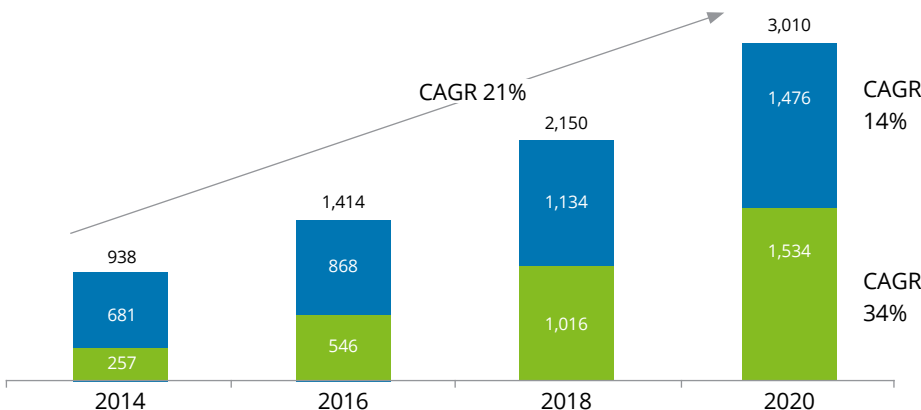
IoT is poised for exponential growth globally, with the number of connected devices expected to grow 5.5X to 20.8 billion and revenue expected to grow over 3X to \$3 trillion by 2020

Global IoT revenue is expected to grow from \$0.9 trillion in 2014 to \$3 trillion in 2020. Similarly, the installed base of IoT units worldwide is expected to grow from 3.8 billion in 2014 to 20.8 billion by 2020.

IoT installed base by category (million units), 2014 - 2020

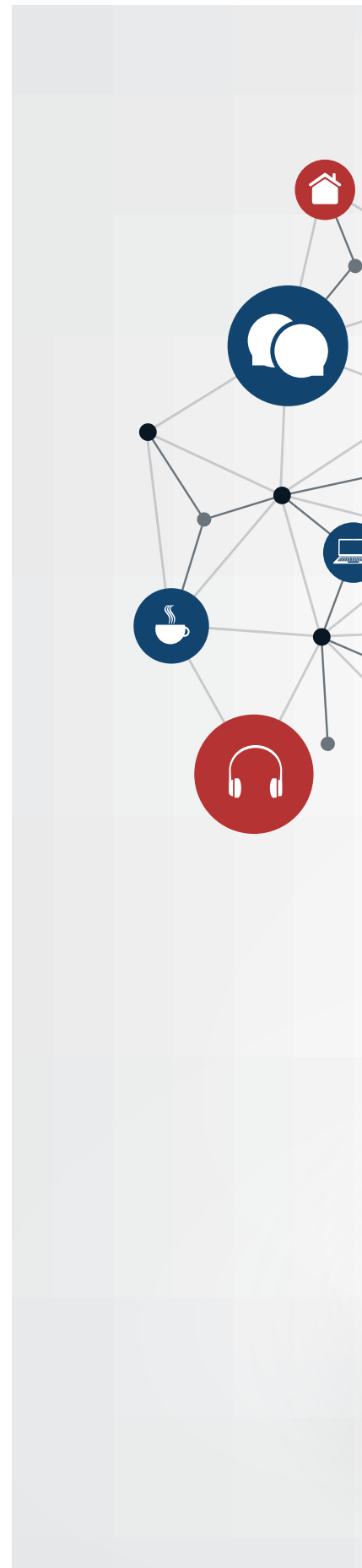


IoT revenue* by category (USD billion), 2014 - 2020



■ Industry ■ Consumer

Source: Deloitte Analysis, Gartner and other Industry reports





IoT applications will help optimize, innovate and transform consumer products as well as business processes

- Optimization: IoT helps reduce costs by efficient product usage while increasing efficient use of assets across business processes.
- Innovation: IoT applications help create differentiated products/ services and improved operations, eventually leading to better customer service.
- Transformation: IoT is blurring industry boundaries by enabling disruptive business models. For example, telematics involves both automotive and insurance industries.

IoT is expected to add value to business processes and take value creation for industrial applications to the next level, specifically in the case of Manufacturing.

- IoT is perhaps the most crucial element of Industry 4.0, which refers to the digital transformation of the processes and systems in the Manufacturing sector.
- Various connected technologies such as high-quality sensors, more reliable and powerful networks, high-performance computing, robotics, artificial

intelligence and cognitive technologies, and augmented reality are changing Manufacturing in profound ways.

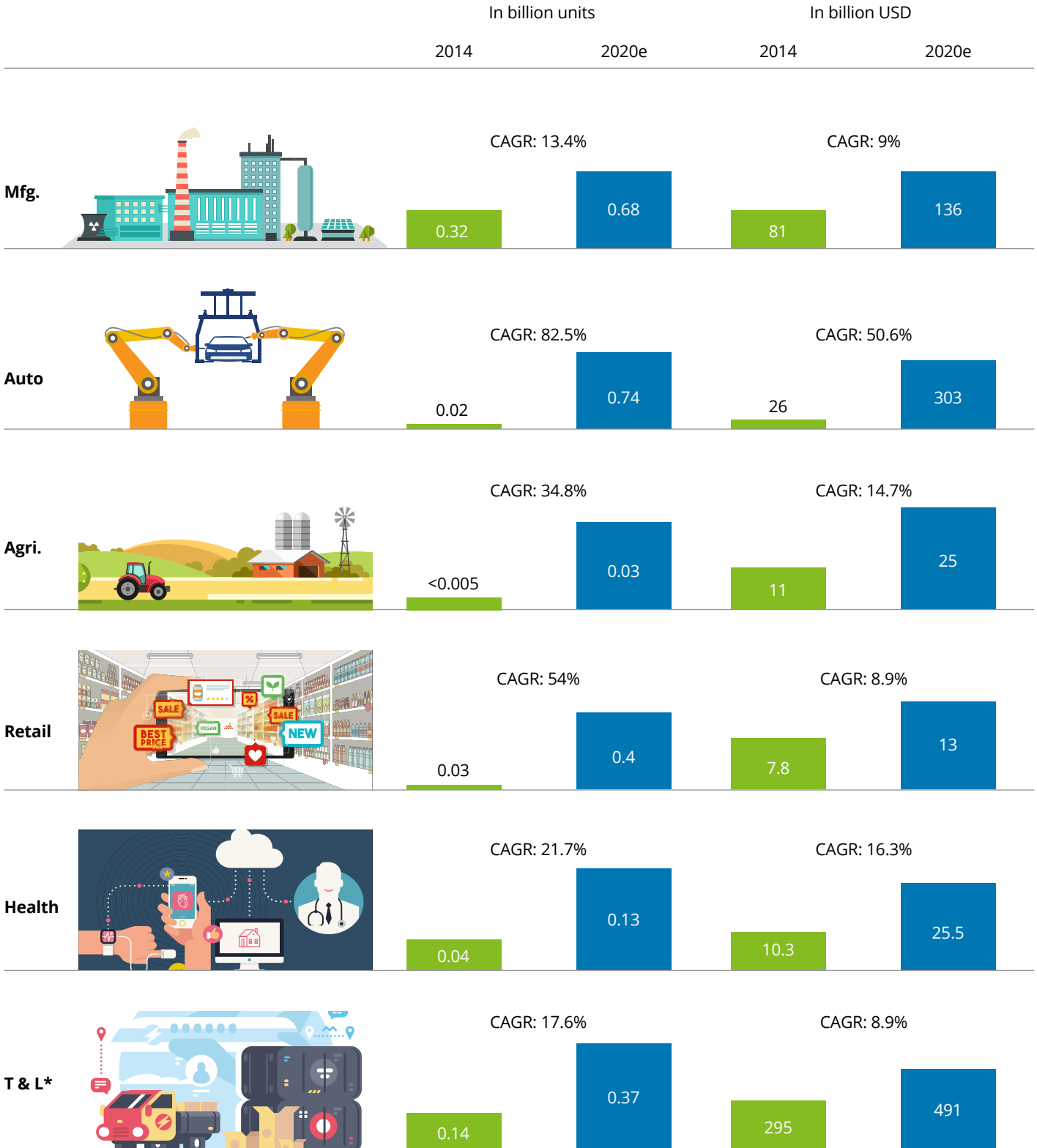
IoT market growth will be driven primarily by connected units in Manufacturing and Automotive industries, with Transportation & Logistics forming the largest share of industry-specific IoT revenue.

Among industries, Manufacturing and Automotive are expected to drive highest volumes in IoT adoption. The installed base of connected units in both of these industries is expected to be approximately 0.7 billion each by 2020.

- While Manufacturing units are expected to grow over 2X from 0.32 billion in 2014 to 0.68 billion in 2020, the installed base for Automotive industry will grow 37X from 0.02 billion in 2014 to 0.74 billion in 2020
- In terms of revenue, automotive industry is expected to see maximum growth to reach \$303 billion by 2020. On the other hand, Transportation & Logistics is expected to drive industry-specific IoT revenue and will reach \$491 billion by 2020



IoT Volumes and Revenues by industry



Source: Deloitte Analysis, Industry reports

Note: Manufacturing units include those from Natural Resources too, Retail units include those from Wholesale Trade, *T & L = Transportation & Logistics
All numbers above include only industry specific units and not consumer units. However, units and revenue for Automotive are across industries

Brief snapshot of some of the IoT use cases/applications across industries is illustrated below:

Industry	Players	IoT Applications/ Case studies
Manufacturing	Stanley Black& Decker	RFID tags with WiFi infrastructure being used to get more visibility to track real-time line productivity
	Airbus	Smart tools being used to perform manufacturing processes such as drilling, measuring, tightening, etc. leading to improvement in production efficiency, by regular monitoring of results
	RioTinto	Sensors and GPS receivers being used on dump trucks to reduce variability of pre-set routes
	Sysmex	Remote monitoring of medical equipment to reduce downtime
	Intel	Smart factories enabling visibility into production issues for an integrated view, thereby increasing efficiency and utilization of equipment
	GE	Sensors installed on engines to reduce downtime via predictive maintenance
Automotive	BMW	Connected cars to integrate vehicle-related services
	Michelin	Tires-as-a-service offering to allow fleet managers to pay for tires on a kilometer-driven basis, thus saving costs
	Daimler	Software installed in truck fleet to send alerts and guide drivers to local dealers stocked with replacement parts
	Mahindra REVA	Secure M2M cellular connectivity to check battery, remotely control air-conditioning, lock or unlock, etc.
	Generali Insurance	Usage-Based Insurance (UBI) for automobiles based on M2M cellular connectivity
	Tesla	Autonomous driving systems based on IoT along with Cloud technology to build driverless cars
Agriculture	Semios	Sensors to monitor insects and pests and schedule release of pesticides
	John Deere	Sensors installed on farm equipment to assist farmers to manage fleet of tractors
	Clean Grow	Carbon nanotube sensors to monitor level of nutrients in crops, assisting farmers to assess the maturity of produce
	Topcon	Connected equipment with GPS, monitoring and electronic controls to help farmers
	OpenIoT	Remote sensors to help farmers monitor vitals such as humidity, air, temperature, soil, etc.
	Observant	Geo-fencing of livestock, along with irrigation scheduling and pump control
Retail	Lord & Taylor	Beacons to push notifications to consumers about a coupon or sale
	Disney	RFID tags to provide access to a variety of services, and track them later
	Amazon	WiFi enabled Amazon Dash Button for consumables to flag low volumes
	Rebeccaminkoff	Re-inventing trial rooms with virtual and smart mirrors, thus helping consumers in making a choice
	Target	Target corporation leverages beacons to make hyperlocal content accessible to shoppers
	Ralph Lauren	Polo shirts that monitor and show heart rate and calories burned if worn during work-outs

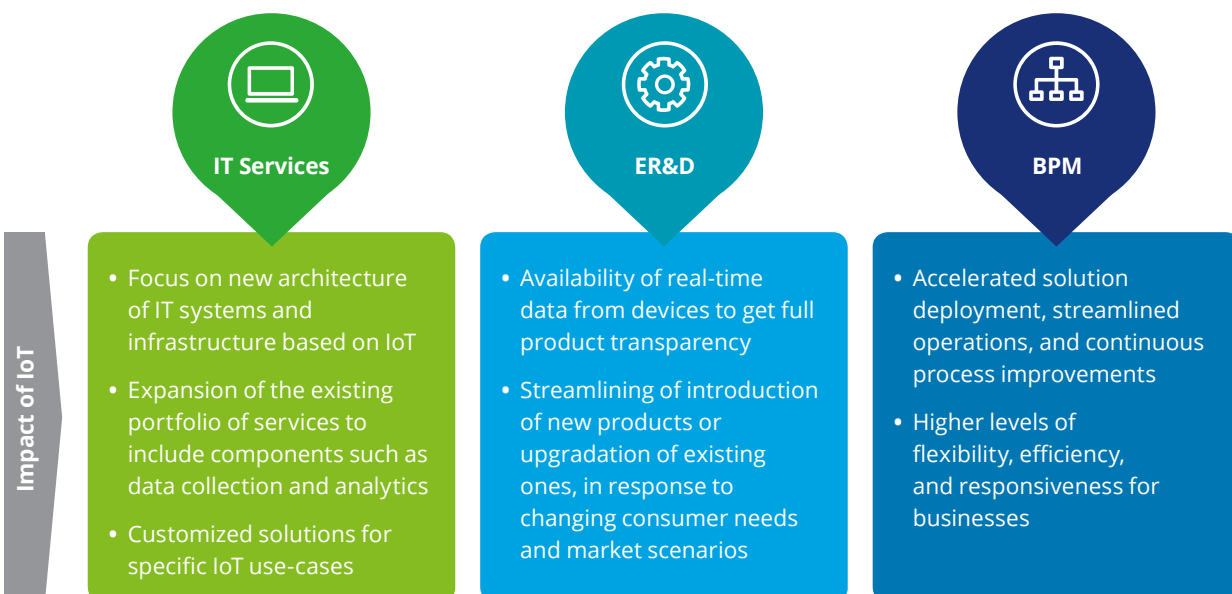
Industry	Players	IoT Applications/ Case studies
Healthcare	Pfizer	Solutions to conduct IoT enabled clinical trials in order to evaluate specific outcomes
	Diabetes Care	Sim-enabled glucometers to monitor and analyze diabetic patients
	Neuro Sky	Mobile devices with sensors to remotely monitor patients with chronic illnesses
	Proteus	Wearable sensor patches to give insights on health patterns, medication effectiveness, etc.
	mimobaby	Sensors placed around the elderly and vulnerable to give information about activity patterns, change in behavior, etc.
	Misfit	Wearable devices to track activities such as walking, biking, etc.
Transport and Logistics	DHL	Sensors to detect whether mailboxes are empty to optimize collection during last-mile delivery
	Port of Hamburg	Aggregated data of ships using sensors, GPS to collect information on traffic, possible congestion and parking spaces
	Schiphol Amsterdam Airport	RFID tags to monitor all baggage carts and ground motorized equipment
	JJ Food Service	Sensors to monitor different temperature bands and quality of the food being delivered
	Purfresh	Sensors to check on the condition of grocery and other consumables supplied
	FedEx	Tracking devices to keep tabs on temperature, location, condition of packages

Source: Deloitte Analysis, Deloitte University Press

Consequently, the technology services industry across IT Services, Business Process Management (BPM) and Engineering, Research & Development

(ER&D) will witness increased opportunities related to IoT solutions. Impact of IoT on technology services (IT, BPM & ER&D)

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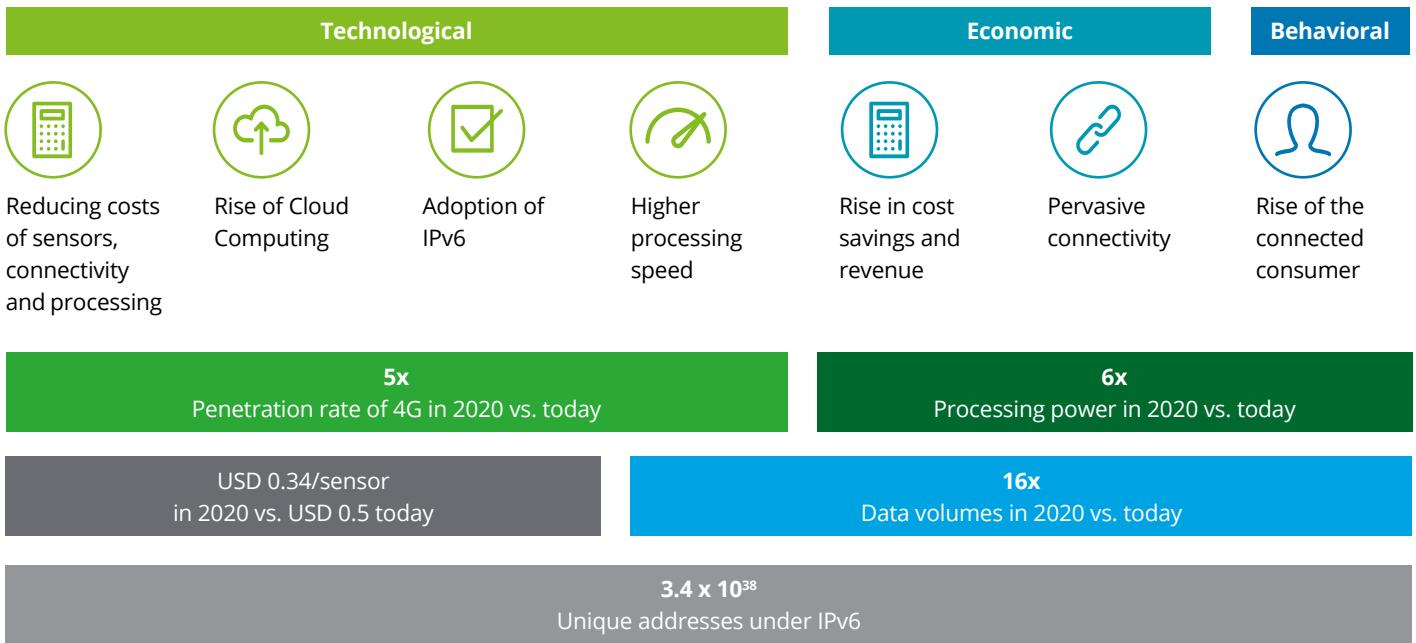


Source: Deloitte Analysis, Industry reports

Various technological, economic and behavioral factors are driving the uptake of IoT globally

- Low cost sensors, declining cost of connectivity as well as reduced cost and time of processing will play a key role in rise and adoption of IoT
- Use of big data analytics and cloud computing will enable processing and analysis of unstructured data to move from insights to foresights
- Consumer interest in IoT technologies is also rising due to increased reliance on mobile devices

Key drivers of the worldwide IoT market



Source: Deloitte Analysis, Industry reports



India is a rapidly growing hub for IoT solutions with market value expected to be \$9 billion, and an installed unit base of 1.9 billion by 2020

- Although India began its IoT journey much later than developed economies, the installed base of connected units is expected to grow at a rate much faster than them. IoT units in India are expected to see a rapid growth of ~32X to reach 1.9 billion units by 2020, from its current base of 60 million. As a result, India IoT market is expected to grow ~7X to move from \$1.3 billion in 2016 to \$9 billion by 2020.
- Rise of the tech-savvy consumer along with increasing smartphone and mobile internet penetration is driving consumer IoT applications in the India market. However, consumer IoT adoption is expected to be slower than its industrial counterpart due to cost of IoT devices and security as well as privacy concerns of consumers.

The Indian IoT ecosystem has a diverse set of ~120 players including Hardware Vendors, Application Vendors, Network Operators and System Integrators; 60-65% of these players are start-ups

- IoT presents opportunities for players across the value chain, with Application Vendors expected to garner 50% share of the India IoT market.
- Application vendors are focusing on both vertical and horizontal solutions including Consumer and Industrial IoT. In addition to catering to a large segment of consumers, they are looking to offer customized solutions for niche consumer groups.
- Hardware vendors are increasing investments in R&D to develop and expand their product portfolio in IoT and enhancing market share through acquisitions.
- Telecom firms are increasing investments in networks such as SigFox to increase connectivity revenues.
- System integrators are investing heavily in their IoT consultancy and implementation services while focusing on building digital capabilities and solutions for IoT by acquiring niche companies and platforms.
- Start-ups offering innovative solutions, are playing a significant role in driving the growth of IoT in India.

IoT adoption in India is expected to grow across industries

- By 2020, industries such as Utilities, Manufacturing, Automotive and Transportation & Logistics are expected to see highest adoption levels in India. Government of India planned investment worth \$1 billion for 100 Smart Cities, over the next 5 years, is expected to be a key enabler for IoT adoption across these industries.
- Industries such as Healthcare, Retail and Agriculture are also expected to make significant progress in IoT adoption.



Key Technologies Enabling IoT

Technology	Definition	Examples
Sensors	A device that generates an electronic signal from a physical condition or event	Small, robust, and inexpensive sensors create information from conditions in the surroundings
Networks	A mechanism for communicating an electronic signal	Wireless networks with ubiquitous coverage such as cellular connectivity, WiFi, or LPWA networks
Standards	Commonly accepted prohibitions or prescriptions for process framework	Technical standards enable processing of data and also interoperability among different devices
Augmented Intelligence	Analytical tools that improve the ability to describe, predict, and exploit relationships among phenomena	Databases with unstructured information are searched and analyzed for corrective future actions
Augmented Behavior	Technologies and techniques that improve compliance with prescribed action	Several machine-to-machine interfaces remove fallible human intervention

Source: Deloitte Analysis, Industry reports

Key Challenges Impeding IoT Growth and Adoption

Despite the presence of numerous enablers, various challenges are currently impeding global IoT growth:



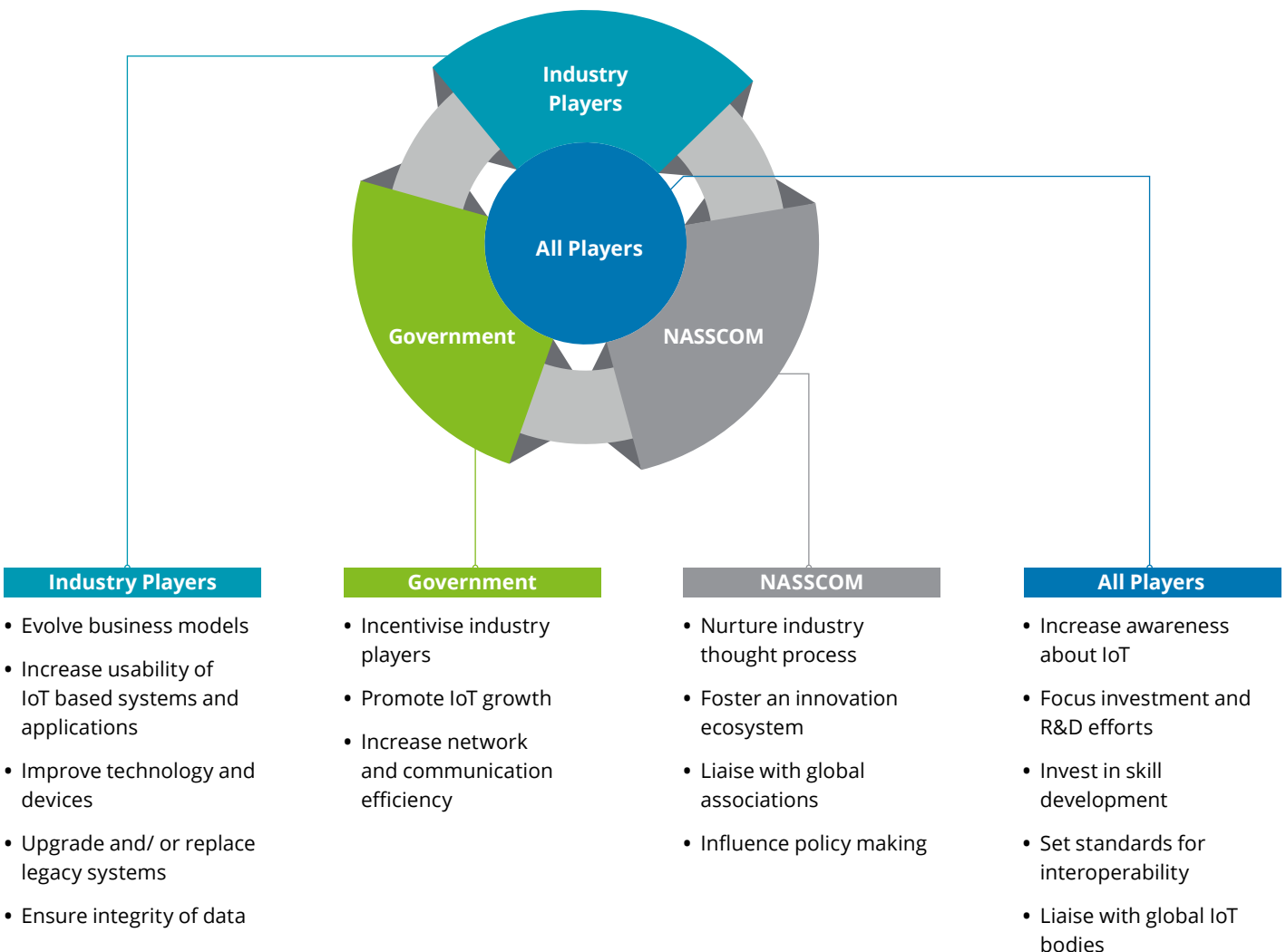
Source: Deloitte Analysis, Industry reports

Conclusive Remarks

Indian market players along with the Government will need to focus on developments across IoT technology, manpower skill-sets and business models, in order to build a scalable, conducive ecosystem.

- The Government of India has proposed a multi-dimensional approach in its draft IoT policy, to develop the IoT market in India by 2020.
- India needs to continue to build capabilities across technology areas of sensors (to adapt to rugged climate/ terrain in India) along with network infrastructure, standards and augmented intelligence and behavior.

- Various accelerators and incubators in India are enabling start-ups to build innovative IoT solutions.
- Addressing current talent gaps in terms of cross-functional as well as specialized skillsets, is imperative for growth of IoT in India.
- Key stakeholders such as the Government, industry players and associations, must collaborate to ensure successful adoption of IoT in India.



Source: Deloitte Analysis

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