Internet of Things in India: Present Scenario, Future Prospects and Challenges

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***Abstract*:- The introduction of IoT in India has brought the next level industrial revolution also known as Industry 4.0. IoT plays a leading role in an evolving IoT business and technology context besides in the new "Digital India" program launched by the Government. According to a recent report, IoT investments in India were close to USD 5Bn in 2019, and this is expected to go up to USD 15Bn in 2021.**

Keywords: internet of things, India, industry, challenges

INTRODUCTION

IoT, Industrial IoT and Edge Computing are growing at an incredibly fast pace and have become an integral part of our daily lives through applications such as intelligent tracking system in transportation, industrial wireless automation, public safety, personal health monitoring, and health care for the aged community. The potential is seemingly endless. We are living in the future that we once thought was a lifetime away.

Since IoT devices are connected with the web, they can be hacked just like any other internet-enabled device. With such a high level of device connectivity being brought into businesses can create a significant data security risk. With past security alert incidents like hackers shutting down IoT gadgets, and security attacks against enterprise infrastructure, electrical grids, dams, etc., it seems that IoT security may not just be about home or enterprise data security but also national security.

The figure below show the top IoT 2020 trends in India:

1. Smart Cities: Smart Cities is everyone's choice today. Thanks to IoT, Smart Cities will continue to expand its reach with hi-tech technologies that will leverage data of IoT devices between entities. IoT provides scope for better cities which entails smart lighting, automated parking, environment sensible to check pollution levels, smart irrigation, waste generation, walkable localities and smart homes to make better use of infrastructure, ensure the safety of residents and help in the resource management efficiently.
2. Smart Factories: IoT can boost productivity by enabling automation and real-time data analytics and ensure seamless operations with high-quality output by optimizing workflows and detecting errors missed by the human eye. It can also help to save production time and track assets in the factory and help consolidate control rooms.
3. Data-Driven Healthcare: Using IIoT, Healthcare service providers can access real-time data to remotely monitor patients and mitigate the risk of diseases. As a result, the healthcare workforce can focus more on research, learning, and patient fulfilment.
4. Artificial Intelligence (AI): AI capabilities allows businesses to extract more value out of their massive collection of data. AI will analyse the data collected through IoT devices in various ways such as data preparation, visualization of streaming data, real-time location, predictive analysis and so forth.

5. Data Processing with Edge Computing: Edge Computing stores data on a local device near the IoT device, before sending it to the cloud that can be used for sorting and calculating the data. In the coming years, more organizations will adapt edge computing with affordable edge devices as there will be less bandwidth consumption by IoT devices using Edge Computing.
6. Smart Retail: Retail experience is getting smarter and better with utilization of RFID (Radio Frequency Identification Tags) and use of IoT devices. By using IoT devices, store managers can find out the way visitors spend their time in the stores, can track their movements and analyse, and manage inventory well.
7. Fitness: Real-time data from fitness trackers and health devices can provide qualitative life by monitoring health conditions like blood pressure, blood sugar level, heartbeat rate, etc. In an emergency, healthcare smart devices can issue alerts to the concerned person/department.
8. Telecommunications: In the coming years, the number of connected devices and IoT applications will increase with the rollout of 5G. Hence, redefining our lives in the hyper-connected zone.

Objectives

1. To understand present scenario with respect to internet of things in india
2. To understand future prospects of internet of things in india
3. To understand challenges faced by internet of things in India

LITERATURE REVIEW

Kevin Ashton, a British technological pioneer coined the term 'Internet of Things' to support the idea of supply chain management in 1999. However, in the past few years the term has become more comprehensive and now includes wider spectrum of services like Healthcare, Transport, Utilities, Consumer goods etc.

The authors F. Bader and S. Jagtap in "Internet of Things Linked Wearable Devices for Managing Food Safety in the Healthcare Sector," 2019. describes the concept of Internet of things along with the architecture of IoT, protocols to develop IoT Architecture and challenges for developing Intelligent system for real time environment.

The authors in P. Aswale, A. Shukla, P. Bharati, S. Bharambe, and S. Palve, "An Overview of Internet of Things: Architecture, Protocols and Challenges," in Information and Communication Technology for Intelligent Systems, Springer, 2019, pp. 299–308 describes smart urban Ecosystem which includes smart cities environment, applications and infrastructure.Integration of cyber and physical component to control and monitor urban environment.

F. Cicirelli, A. Guerrieri, C. Mastroianni, G. Spezzano, and A. Vinci, The Internet of Things for Smart Urban Ecosystems. Springer, 2019 describes the concept of automatic smart parking system by using IoT. Smart parking will be using cloud services for storing information about various vehicles along with their IN-OUT time, number of parking slot, number of parking slots available. Components for smart parking will include Raspberry Pi, Camera, IR sensors, Display device, User device etc

RESEARCH DESIGN

The research is based on secondary sources from various sources such as internet, journals, reports and newspapers.

RESULTS

In the northern Indian city of Kohima, data collected from sensors and other internet of things (IoT) devices is being used to manage street lighting, ensure public safety and deliver a slew of citizen services. And between the capital city of New Delhi and Varanasi in Uttar Pradesh, the Vande Bharat Express – India's first semi high-speed train – uses a collision-avoidance system comprising sensors and other IoT devices to prevent accidents due to human error or equipment failure. In agriculture, Tea Tantrum, a supplier of wellness and premium teas in India, is using IoT technology to monitor moisture content and maintain the ingredient proportions of some of its products. Industry watchers have singled out India as a hotspot for IoT deployments, with the market expected to reach $17bn by 2021, according to Ray Wang, founder and principal analyst at Constellation Research. Across the world, spending on software and hardware related to IoT is projected to grow rapidly, from US$726 billion in 2019 to US$1.1 trillion in 2023, according to a market research report.2 A recent IoT industry spending report reveals that Asia/Pacific accounted for most of the spending on IoT in 2019, with India spending US$20.6 billion3. After COVID-19, focus is on conserving cash in India. The following three trends are expected:

• De-growth in 2020; possibly going into H1 2021
• Companies mandated to use IoT to reimagine new ways of operating
• Growth after H2 2021 is expected to be much faster after COVID vaccine/treatment is found

The above trend is also corroborated by another recent market research4 covering pre- and post-COVID-19 market analysis. According to this research, the industrial IoT market is expected to grow at a CAGR of 16.7 percent from 2019 to reach US$263.4 billion by 2027. A few of the compelling reasons why organisations use IoT are to reduce cost and/or increase revenue, enhance safety and security, and improve product quality. Drivers that are increasing IoT adoption in the markets include the following: low cost of storing and computing data on the cloud platform; emerging trends on edge computing; falling costs of connectivity, sensors, and devices; and increasing smartphone penetration and mobile app development platforms. In this section, we will focus on key high-value drivers – cost reduction, revenue growth, security, and safety. These drivers, along with quality control measures, are expected to be critical in accelerating IoT adoption. Hence, understanding these elements and the potential use cases that could support the adoption of IoT is crucial.

The Indian market has the following three sectors: enterprise/industrial, consumer, and services/public. Each segment has distinct characteristics and market opportunities. COVID-19 is expected to further accelerate the investment pace in IoT.

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 Insights

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

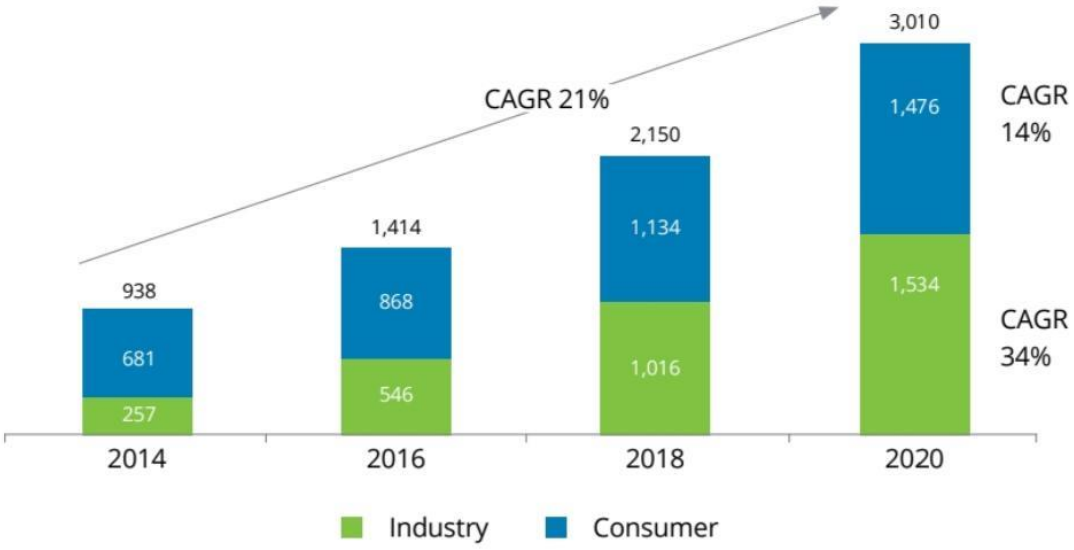
Enterprise/industrial: This segment is driven by manufacturing and product development. The life sciences, discrete manufacturing, and process manufacturing industries, along with utilities, will be spending most on IoT solutions in the coming years The trend is expected to continue with the majority of the use cases focusing around enhancing asset tracking and asset life with condition-based maintenance and equipment tracking and the ability to enforce physical distancing.

Consumer: Focus on customer experience has driven investments in this sector. Smart home and connected vehicle are expected to drive investments in IoT. The consumer sector is expected to overtake process manufacturing to become the second-largest source of IoT spending by 20233 Large-format commercial retail, and travel and transport hubs (such as airports) are also likely to invest in IoT-based solutions as a direct result of COVID-19.

Services/public sector: The Government of India (GoI) has taken several initiatives (discussed later in the report) that have encouraged most of the IoT spending. Considering the government's plans of launching 100 smart cities, 500 rejuvenated cities, and numerous projects to create industrial hubs, the segment has a substantial potential for IoT spending. With IoT software spending totalling US$39.3 billion in 20193 in APAC region and the fastest growth (a CAGR of 14.4 percent) expected over the five-year forecast period (2018-23), let us understand the industries that are making significant investments in IoT technology and promoting its growth in India.

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

IoT revenue by category (USD billion), 2014 – 2020



Source: Deloitte Analysis, Gartner and other Industry reports

Challenges in Securing IoT

The rise in demand of IoT-connected devices and IoT app development comes with various security challenges. The whole security of an IoT network depends on a single device in the chain. If one of the devices gets breached, it compromises the entire security of every other device connected to this chain. This could easily compromise the safety of th Challenges in Securing IoT

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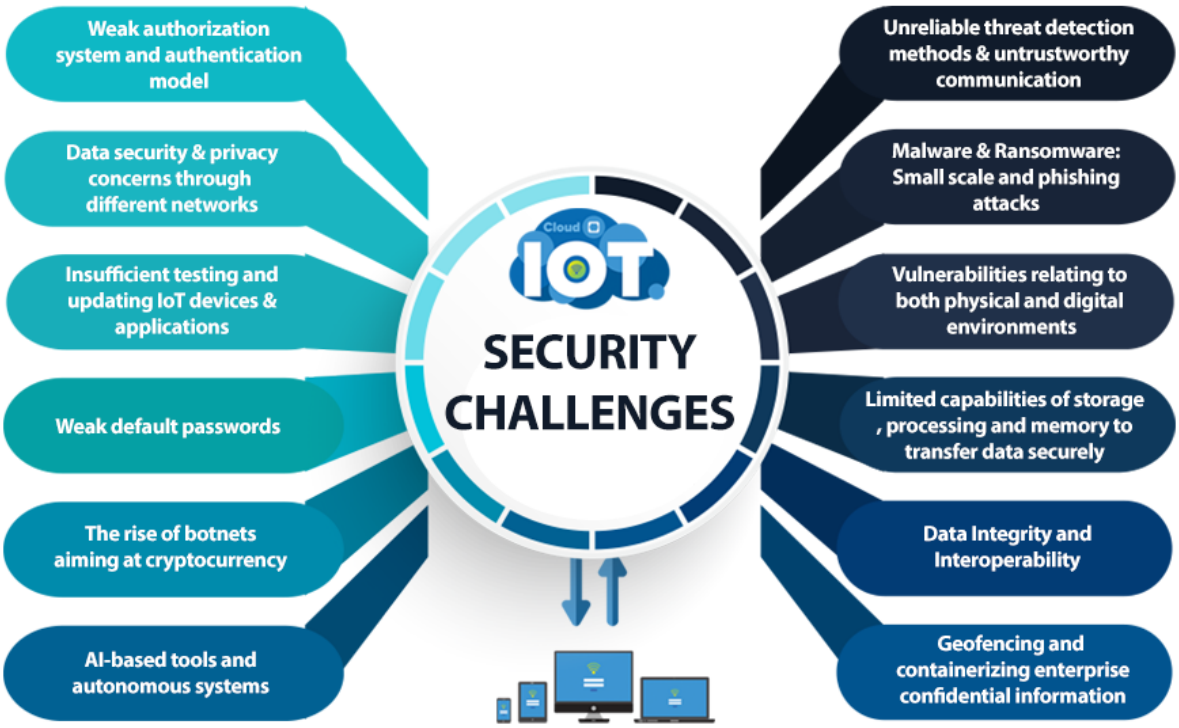

SUMMARY

The global Internet of Things market is expected to reach USD 1,854.76 billion by 2028, exhibiting a CAGR of 25.4% during the forecast period. The market is expected to gain impetus from the rising adoption of digital twins by a wide range of industries. They help in transforming the physical assets of the industries into a virtual representation. It aids in controlling, examining, and viewing the operations based on the digital platform.

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