

# Challenges and Future Scope of IoT in India

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## Abstract

Internet of Things (IoT) means to connect different devices that are embedded with sensors to interchange information or data over the internet over wired or wireless network. IoT is used in different fields like automation of homes and buildings, security systems, home appliances, healthcare's, smart cities, smart agriculture, smart living etc. IoT is useful in every sector but there are security and privacy issues that are major concerns of IoT. In this paper we will analyze the challenges, security issues, risk factor and future scope of IoT in India.

**Keywords:** Internet of Things, Smart home, Smart Cities, Smart Living, Healthcare, Security issues, IoT Challenges.

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## I. Introduction

Internet of Things (IoT) represents connecting of devices with the help of internet that can be wired or wireless. IoT means communication or transferring of information between devices without human interference i.e. it is basically Machine-to-Machine communication. In today's time demand of IoT is increasing day by day because of its use in every aspect of human life be it home, health, transport, industry, agriculture and defense. As we are rapidly moving towards digitization more of IoT devices will need to be established and linked to the internet.

According to 2020 report on IoT spending by IDC[4], the Worldwide spending on IoT will return to double-digit growth in 2021, with the CAGR of 11.3%. As everything from smart sensors to smart home appliances, and from smart factories to connected healthcare devices, the extension of the IoT market reflects that of a booming business sector.

As IoT devices are connected with the internet, these devices can be hacked like any other internet-enabled devices. It can create a high 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[6].

## II. IOT ADOPTION IN INDIA – APPLICATION OF IOT

IoT as a technology has been maturing for some time and seems poised for continued growth in India. This growth is expected to be driven by specific sectors, such as agriculture, utilities, manufacturing, and infrastructure that are responding to big changes in their operating environment. IoT is also being adopted in the consumer goods industry to enhance user experience. Government policies and interventions can help further accelerate IoT adoption[14].

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, released by Zinnov[5] in June 2020, IoT investments in India were close to USD 5Bn in 2019, and this is expected to go up to USD 15Bn in 2021.

IoT technologies offer tremendous growth opportunities and India has set the stage for becoming an IoT powerhouse[14].

Some of the latest upcoming trends on which India has already started working are below(Fig.1)[6]:



**Fig. 1:** Latest Trends of IoT in India[6]

1. **Smart Cities:** Smart cities are everyone's choice today. With the support of IoT, Smart Cities will continue to extend its scope with hi-tech technology that will leverage data of IoT devices between entities. The Internet of Things provides scope for better cities that include smart lighting, automated parking, a sensitive environment to check pollution levels, smart irrigation, waste generation, walkable sites, and smart homes to make better use of infrastructure, ensure population safety and help manage resources efficiently.
2. **Smart Factories:** The Internet of Things can improve efficiency by allowing automation, real-time data analytics, and ensuring smooth operations with high-quality performance by optimizing workflows and spotting bugs missed by the human eye. It can also help save production time, monitor assets in factory, and help integrate control rooms.
3. **Data-Driven Healthcare:** With the Internet of Things, healthcare providers can access real-time data to monitor patients remotely and mitigate disease risks. As a result, the healthcare works will focus more on research, learning, and patient satisfaction.
4. **Artificial Intelligence (AI):** AI abilities permits companies to extract greater cost from their massive information collection. AI will analyze the data collected by IoT devices in numerous ways like data preparation, visualization of streaming information, real-time location, predictive evaluation, etc.
5. **Data Processing with Edge Computing:** Edge Computing stores the information on a local device close to the IoT device, prior to sending them to the cloud that can be used to classify and calculate the data. In the coming years, more organizations will adapt the edge computing with affordable edge devices as there will be less bandwidth consumption of the IoT devices using Edge Computing.
6. **Smart Retail:** The retail experience is getting smarter and better with the use of RFID (radio frequency identification tags) and the use of IoT devices. By using IoT devices, store managers can discover how visitors spend their time in stores, can track their movements, and analyze and manage inventory well.
7. **Fitness:** Real-time data from fitness trackers and health devices can enable quality living by monitoring health conditions like blood pressure, blood sugar levels, heart rate, etc. In an emergency, smart healthcare devices can send alerts to the person / department concerned.
8. **Telecommunications:** In the coming years, the number of connected devices and IoT applications will increase with the introduction of 5G. This redefines our life in the hyper-connected zone.

Applications of IoT technologies are multiple, because IoT technology is vital and adjustable to most emerging technology that's capable of providing data in terms of relevant information about operations, performance and even environmental conditions that we want to watch and analyze. Today, many companies from different sectors are adopting IoT technology to analyze, simplify, improve and automate different processes. While IoT applications offer several benefits that are sure to redefine our lives, it comes with a set of challenges that must be addressed to make it work effectively.

### III. SECURITY AND IMPLEMENTATION CHALLENGES OF IOT IN INDIA

The increase in demand of IoT-related devices and IoT app development is supplied with different security requirements. The entire safety of an IoT network depends on a single device in the chain. If one of the devices gets broken, it affects the entire security of other devices that is connected to this chain. This could easily affect the security of the entire network[6].

Increasing interest from industries in implementing IoT in their businesses to raise operational efficiency is driving the growth of IoT in India. However, despite growing demand, Indian companies still have little capacity to implement, operate and finance the implementation of IoT due to various reasons. In addition to implementation, there are multiple security issues in IoT devices and networks that can lead to a data breach or disruptive flow of data from source to platform. IoT systems require users to select a reliable and compliant architecture in accordance with business requirements to ensure a secure flow of data and communications.



Fig. 2: Challenges in securing and implementing IoT[7]

Following are some security and implementation challenges in India[7]:

**A. Internet availability**

Reliable internet connectivity is an important requirement for the operation of IoT. IoT equipment and solutions depend on network speed and quality to operate seamlessly. In an infrastructure like India where the system is still under development, network connectivity is still an issue in remote areas. Internet connection in cities is still better than in remote areas where poor speed and connectivity for IoT consumers still pose a problem. Due to the lack of an established internet connection, there is a high likelihood that devices will experience network failures that put data security at risk.

**B. Data security**

Due to the limited processing, storage, and memory capabilities in network-based video recording, the devices are unable to support encryption and other processing functions to securely transfer data from one platform to another, which makes recorded data more vulnerable to security. The high cost of secure storage platforms like cloud is a factor that makes companies more dependent on other forms of video storage. The cloud can provide greater security with the direct transfer of data from the device to the platform in real time.

**C. Remote locations**

Business sites that are located in remote locations have to face network and connectivity challenges during IoT deployment and operation, as the Internet is not yet available everywhere with the same speed. The operation of IoT devices and solutions is dependent on bandwidth. Internet connectivity in remote areas, is becoming a challenge for companies to access data and videos captured from devices in different locations in real time.

#### D. Integration of products and platforms

Indian consumers are very selective when it comes to investing in hardware or upgrading the devices. Integration of IoT applications with the right platform is required for a successful implementation. Inadequate integration leads to various anomalies in the IoT functions and does not provide efficient values to the consumers.

#### E. Strategic decisions

Companies often lack the ability to identify their business requirements to achieve IoT. If choices and plans related to IoT are made without considering or analyzing needs, they can result in failure. Business leaders should identify cases and areas of failure in their business that require IoT solutions to integrate action plans with the right IoT architecture

#### F. Interoperability

There are several factors such as sensors, analytics, network, and cloud that together make IoT implementation deliver optimal results. Without identifying the overall impact before deploying IoT will lead to a failed system delivery. Due to a lack of skills and vendor support, companies are often unable to acquire the right IoT architecture based on their business infrastructure.

### IV. IOT INITIATIVES IN INDIA

Some of the key initiatives on IoT taken by the Government of India (GoI) are as follows:

- 1. Draft IoT Policy 2015:** Ministry of Electronics and Information Technology (MeitY, earlier referred as DeitY) launched India's first draft of IoT Policy Document in 2015[8] – a strong governance framework for holistic implementation and execution of IoT-related policies
- 2. National Digital Communications Policy (NDCP)[9] 2018:** Futuristic goals and policy initiatives undertaken by NDCP to address the problem of communications and access of digital services in India
- 3. Smart Cities Mission (SCM) 2015:** Smart City Mission[10] was launched in 2015 to drive economic growth and improve quality of life by using technology as a means to create smarter outcomes
- 4. IoT Centre of Excellence (CoE) by NASSCOM, MeitY and ERNET:** CoE is specifically designed to help Indian IoT Start-ups to create market-leading products. CoE is India's largest deep tech innovation ecosystem[11].
- 5. IoT lab, a partnership between IIT Delhi and Samsung:** MoU between IIT Delhi and Samsung was signed in 2016[12], with the objective to enhance research capabilities and industry collaboration in IoT space.

### V. FUTURE SCOPE OF IOT IN INDIA[13]

As the world gets increasingly connected, the global IoT spending is set to increase significantly over the coming years. Though there are still security concerns with the IoT—that are yet to be addressed—a study by Cradlepoint (industry leader in cloud-delivered 4G LTE network solutions for businesses, service providers and government organizations) reveals that close to 70 per cent organizations have adopted, or plan to adopt, IoT solutions within the next year. Bain predicts the combined markets of the IoT will grow to about US\$ 520 billion in 2021, more than double the US\$ 235 billion spent in 2017 (Fig. 4).

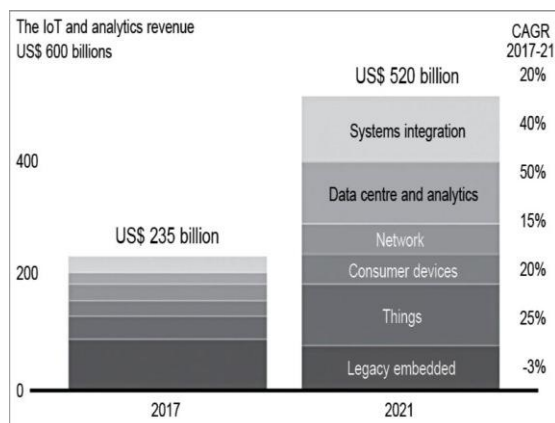


Fig. 4. Forecast on the growth of the global IoT market

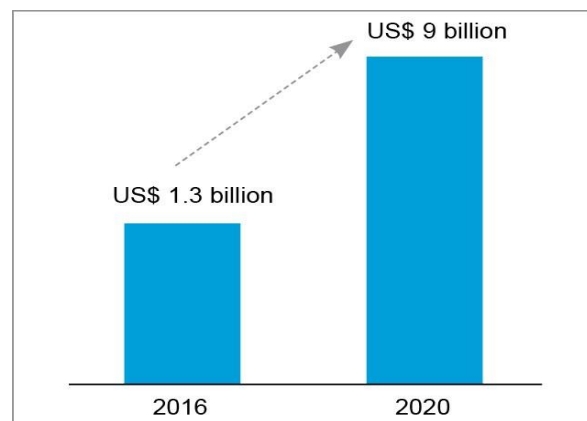


Fig. 5. The Indian IoT market

#### a). The Indian market scenario

India is rapidly growing as an IoT hub. Although, the country began its IoT journey much later than developed economies, its installed base of connected units is expected to grow at a rate much faster than them.

Rise of the tech-savvy consumer along with increasing smartphone and mobile Internet penetration is driving consumer IoT applications in the Indian market. However, the consumer IoT adoption is expected to be slower than the IoT adoption in industrial applications due to cost of IoT devices, security as well as privacy concerns of consumers.

According to the Deloitte study, application vendors focusing on both vertical and horizontal solutions, including consumer and industrial IoT (IIoT), are expected to garner 50 per cent share of the Indian IoT market. Network operators are increasing investments in new networks, such as SigFox, to increase connectivity revenues. System integrators are focusing majorly on IoT consultancy and implementation services, while enhancing digital capabilities and building solutions for the IoT through acquisition of niche companies and platforms. Startups with innovative solution portfolios are playing a significant role in driving the growth of the IoT in Smart India.

**b). Applications in demand**

The IoT adoption in Smart India is expected to grow across industries. Some key industry sectors driving it are transportation and logistics, utilities, manufacturing and automotive. These are expected to see highest adoption levels in India due to direct association with smart city projects. Moreover, sectors such as healthcare, retail and agriculture are also expected to make significant progress in IoT adoption.

The IoT applications in Smart India across industry sectors can be bucketed under three broad categories: consumer, industrial and public sector.

**c). Consumer applications of the IoT**

While organizations expect the IoT to increase automation and therefore improve productivity, consumers expect it to improve the overall quality of life. A research conducted by Tata Communications, presented in Fig. 6, showcases consumer expectations from the IoT.

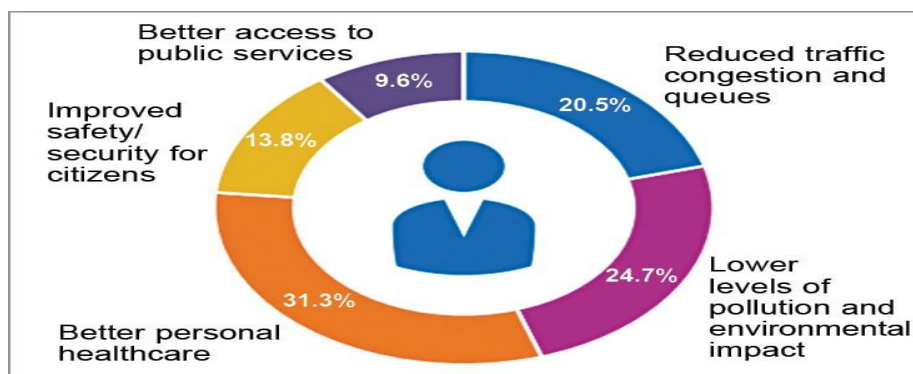


Fig. 6. Indian consumer expectation from the IoT (Tata Communications, 2018)

The perception of the common people regarding the IoT is limited. A large number (~35 per cent) of people from the same survey mentioned above relate the IoT with only smartphones. Although this is not incorrect, the IoT is much more than just phones. Only ~14 per cent of all people surveyed (Fig. 7) mentioned all connected devices.

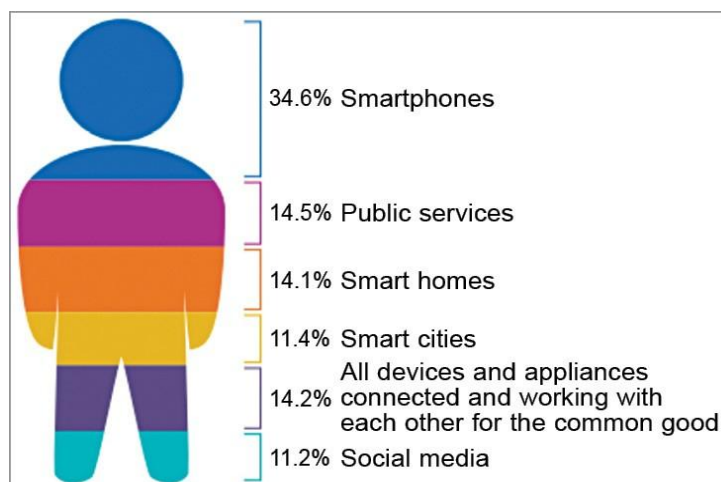


Fig. 7: Consumer insight by the IoT association (Tata Communications, 2018)

Although most of the current developments in the IoT are focused on industrial opportunities, there has been traction in the consumer space, too. The IoT applications for consumers are opening new and intimate entertainment experiences. Shifting consumer preferences towards smart sensors, wearables and clustered systems, like fitness trackers or smart homes, are triggering growth in the consumer application of the IoT.

Smartphone applications that can lock doors, reset thermostats and more already exist. Firms are coming up with ways of cooking that can be done and monitored from the comfort of the living room sofa through the smartphone. Increasing sophistication of sensors makes it possible for devices to understand consumers at unprecedented levels.

**d). Industrial applications of the IoT.**

Globally as well as in India, industrial adoption of the IoT has far exceeded consumer applications. The term Industry 4.0 heralds the coming of a new industrial revolution through smart manufacturing. The IoT is expected to drive operational efficiencies through automation, connectivity and analytics.

Industrial applications broadly include improved automation, efficient tracking and effective management through connected systems. In India, such sectors as manufacturing, automotive, transportation and logistics are experiencing the highest adoption levels of the IoT. Typical industrial applications include:

- **Manufacturing/supply chain:** Improved process automation, connected factory, robotics, tracking of goods, tools, etc
- **Agriculture:** Handheld devices to figure out moisture/pH factor of soil, etc
- **Transportation:** Improved vehicle tracking, traffic management, etc
- **Energy:** Efficient management of energy usage, potential faults, etc

**e). Public sector applications of the IoT**

The IoT has significant applications in the public sector as well. The chart given in Table I (Fig.8 ) lays down the potential end use of the IoT in this sector. In India, the government’s push for smart cities is expected to be a key enabler for IoT adoption across a large number of these areas

TABLE I IoT APPLICATIONS IN PUBLIC SECTOR		
Category	Sub-category	Example
Transportation	Public transportation	<ul style="list-style-type: none"> <li>• Using GPS tracking devices, we can enable real-time monitoring of buses and give better information on waiting times</li> <li>• Using swipe-card information, we can analyse peaks in use and provide a better supply of buses</li> </ul>
	Traffic	<ul style="list-style-type: none"> <li>• Using GPS tracking devices or presence detection sensors, we can enable real-time traffic analytics and have a smarter control of traffic lights to prevent traffic congestion</li> </ul>
	Public bikes	<ul style="list-style-type: none"> <li>• Using GPS tracking devices, we can analyse where public bikes are most needed and also balance the availability of bikes at different locations</li> </ul>
Economy	Tourism	<ul style="list-style-type: none"> <li>• Using beacons, we can push notifications on smartphones based on location and give people additional information about a place in a city or an art object in a museum</li> </ul>
	Industry	<ul style="list-style-type: none"> <li>• Smart infrastructures</li> </ul>
Health	Assistance to people	<ul style="list-style-type: none"> <li>• Using a single-push button, we can send an emergency alert</li> </ul>
	Automated medication	<ul style="list-style-type: none"> <li>• Using medical devices, we can automate the supply of medicine for people with diabetes or high blood pressure and send alerts to the doctor when the device detects a problem</li> </ul>
	Maintenance of medical devices and failure detection	<ul style="list-style-type: none"> <li>• Using a sensor, a battery-powered medical device could send a notification when a battery needs to be replaced</li> </ul>
Environment	Water supply	<ul style="list-style-type: none"> <li>• Using sensors, leakage in water pipes can be detected</li> </ul>
	Pollution	<ul style="list-style-type: none"> <li>• Using sensors, we can monitor pollution levels and the amount a polluting particle emitted</li> </ul>
Administration	Electronic identity device	<ul style="list-style-type: none"> <li>• Using magic bands, we can have all our identity information and important information updated</li> <li>• Using biometrics, personal magic bands can be secured and prevent identity theft</li> </ul>
Security	Drones	<ul style="list-style-type: none"> <li>• Using computer vision, drones can identify security issues and report them</li> </ul>
	Fire	<ul style="list-style-type: none"> <li>• Using smoke detectors, automated notifications can be sent to intervention centres</li> <li>• Using sensors in gas pipes, we can identify potential sources of fire and deal with them before any damage is caused</li> </ul>

Fig 8: Public Sector Applications of IOT

## VI. CONCLUSION

With the increasing demand of IoT we can improve the efficiency of our industries and other sectors. In this paper we have highlighted some of the concepts related to IoT i.e. we have reviewed some of the applications of IoT, security and implementation challenges in India, some of the IoT initiatives taken by the government of India and future scope of IoT in India. Due to the rise of the devices we are facing security issues. We have to improve these challenges in the upcoming years so that we can make use of these devices more efficiently. For this we have to take some hard steps to remove these issues in industrial, commercial areas.

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