Internet of Things: A New Revolution in India

[1]Parul, [2]Dr. Pink Prabha
[1]M. Tech, [2]Assistant Professor,
[1]MD University Rohtak,
Rohtak, India

Abstract— The concept of Internet of Things has gained momentum over the last decade, owing to collective efforts by industry players, associations as well as academic institutions. The world is moving forward rapidly, and the credit goes to ever growing technology. One such thing is "Internet of things" with which automation is no longer a virtual reality. Internet of Things (IOT) has provided an opportunity to develop powerful industrial system and applications by leveraging the growing ubiquity of RFID, wireless, mobile and sensor devices. This paper highlights the reality of Internet of Things future and challenges in India.

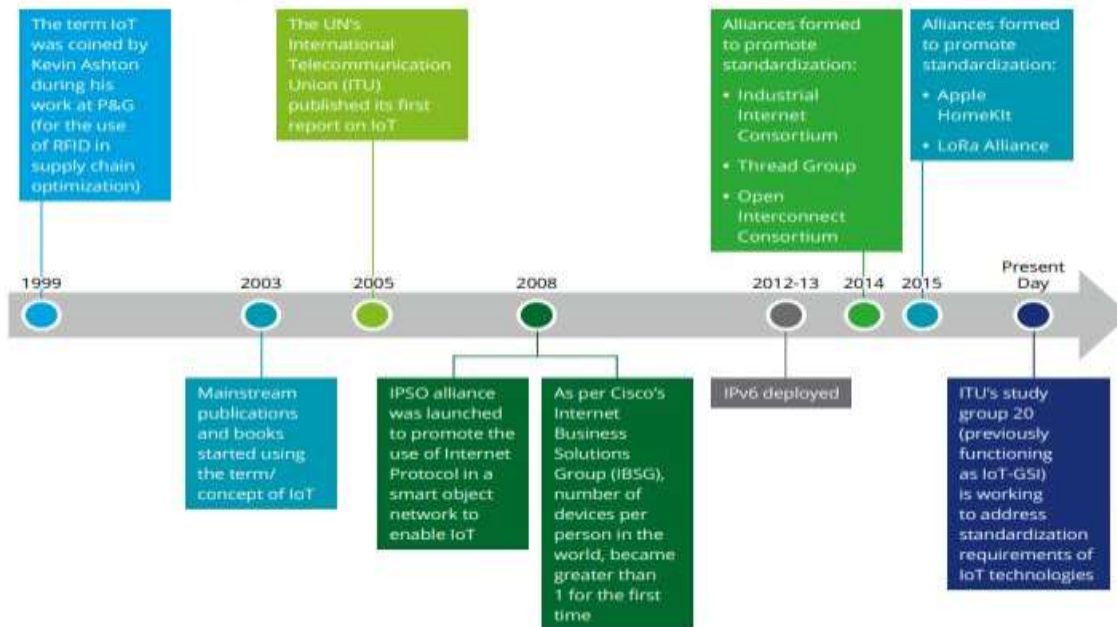*Keywords*— **Automation, Virtual Reality, Technology** etc.

Introduction: Internet of Things (IoT) may further take up some time to proliferate in India and at world; however there are cases where it is being currently used by consumers and industries at a very large scale. While IoT will be able to touch all industries including energy, telecom, healthcare, retail, transportation, manufacturing among others, in India it will have several other use cases based on the country's geographical, demographical and cultural set-up [1]. The economic development of a nation depends upon the industrial growth, which in turns relates to the entrepreneurial skills of the countrymen's. Thus the entrepreneurship acts as a building block for the economic growth of that nation. An entrepreneur transforms ideas into reality with his entrepreneurial skills which include creation, innovation, business expertise and the risk-taking ability [2]. The Internet of Things (IoT) is considered for the fully interconnected world [3]. It can connect all the things with technology and makes a complete new separate world for them to interact with each other with the help of internet. IOT is not just a concept but can prove to be a new technological revolution in advancing technology to change the lifestyles of humans altogether [4]. IOT is something that will not leave any physical or theoretically conceptually unaffected. As it demands communication between the objects, everybody should be able to fetch any information from any device at any point of time from anyone present anywhere and who is a part of any business or service, through any path or network. Constructively, 'availability' is a critical factor that affects the performance of Internet of Things [5]. The Internet of Things (IoT) is the network of physical objects connected with electronics, software, sensors and connectivity to enable it to achieve optimal value and service by exchanging data with the manufacturer or other connected devices. The Internet of Things is today's most trending technology across the globe.

Evolution and Potential of Internet of Things:

The number of internet connected devices (approximate 12.5 billion) had surpassed the number of human beings i.e. 7 billion already in 2011. As Gartner (a research firm) suggested, by 2022, the majority of industrial Internet of Things analytics will be performed at the edge, rather than in the cloud, up from less than 10% in 2017. The installed base of connected units in both manufacturing and automotive industries is expected to be approximately 0.7 billion each by 2020, according to Deloitte – Nasscom report on Internet of Things. [6] IoT is poised for exponential growth globally, with the number of connected devices expected to grow from 5.5X to 20.8 billion and revenue is expected to grow over 3X to $3 trillion by 2020. Global Internet of Thing revenue is expected to grow from $0.9 trillion in 2014 to $3 trillion in 2020. Similarly, the installed base of Internet of Things units worldwide is expected to grow from 3.8 billion in 2014 to 20.8 billion by 2020.

Figure 1: Evolution of IoT and standards (Source: Deloitte- Nasscom and Industry Reports)

Evolution of IoT and its standards

The term IoT was coined by Kevin Ashton during his work at P&G (for the use of RFID in supply chain optimization)

The UN's International Telecommunication Union (ITU) published its first report on IoT

Alliances formed to promote standardization:
• Industrial Internet Consortium
• Thread Group
• Open Interconnect Consortium

Alliances formed to promote standardization:
• Apple HomeKit
• LoRa Alliance

1999   2003   2005   2008   2012-13   2014   2015   Present Day

Mainstream publications and books started using the term/ concept of IoT

IPSO alliance was launched to promote the use of Internet Protocol in a smart object network to enable IoT

As per Cisco's Internet Business Solutions Group (IBSG), number of devices per person in the world, became greater than 1 for the first time

IPv6 deployed

ITU's study group 20 (previously functioning as IoT-GSI) is working to address standardization requirements of IoT technologies

Industries such as utilities, manufacturing, automotive and transportation and logistics are expected to witness the highest adoption levels in our country, whereas industries such as healthcare, retail and agriculture are also expected to make significant progress in Internet of Things adoption. The government's planned investment worth $1 billion for 100 smart cities over the next five years is very much expected to help in this context and be a key enabler for IoT adoption across these big industries. The IoT market is at a turning point—projects are moving ahead from proof of concept into commercial deployments. Organizations are looking to further extend their investment as they scale their projects, driving spending for the hardware, software, services and connectivity required to enable IoT solutions. Technological giants such as IBM, Cisco, Qualcomm and a host of Indian start-ups have begun investing in the Internet of Things space. For example, according to a 20 June news report, German tech major Bosch is looking to invest Rs1700 crore in the next three years in India as it focuses on IoT and artificial intelligence.

Internet of Thing applications will help optimize, innovate and transform consumer products as well as business processes in relation to provide optimal results [7].

- Optimization: Internet of Things helps reduce costs by efficient product usage while increasing efficient use of the assets across business processes.

- Innovation: Internet of Things applications help create differentiated products or related services and improved operations, eventually leading to better customer service.

- Transformation: Internet of Things is blurring industry boundaries by enabling disruptive business models. For example, telematics involves both of the 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 sector.
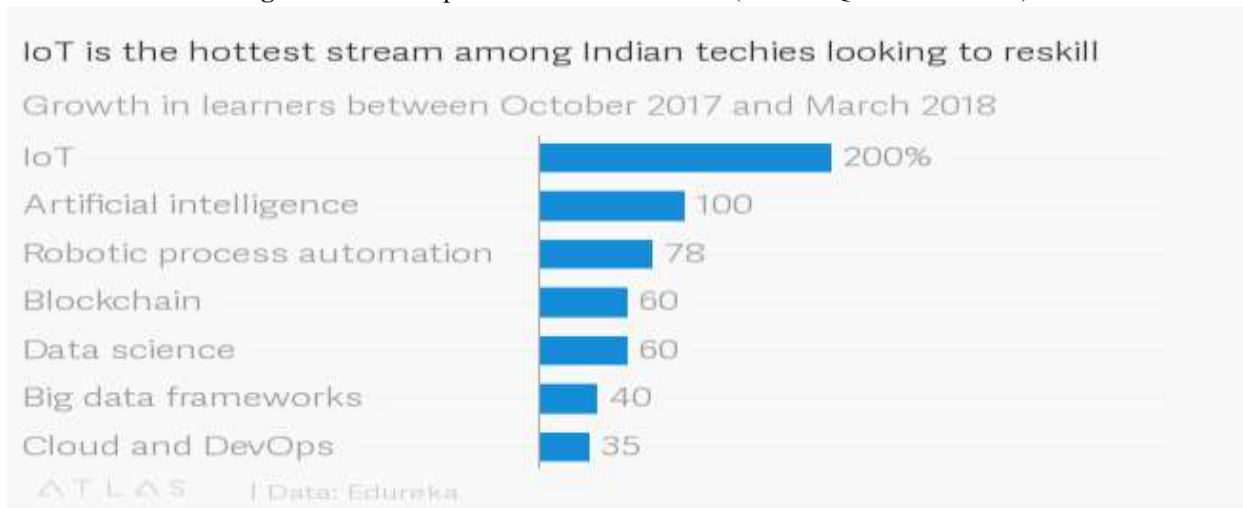
- IoT is perhaps the most crucial element of the Industry 4.0, which refers to the digital transformation of the processes and systems in manufacturing sector.

- 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 an efficient ways.

Internet of Thing 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 the industries, Manufacturing and Automotive are expected to drive the highest volumes in IoT adoption. The installed base of the connected units in both of these industries is expected to be approximately 0.7 billion each by the end of 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 of the Automotive sector 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. Alongside, Transportation & Logistics is expected to drive industry specific IoT revenue and will reach $491 billion by 2020.

Figure 1: IoT Comparison with other streams (Source- QUARTZ INDIA)

IoT is the hottest stream among Indian techies looking to reskill

Growth in learners between October 2017 and March 2018

IoT	200%
Artificial intelligence	100
Robotic process automation	78
Blockchain	60
Data science	60
Big data frameworks	40
Cloud and DevOps	35

ATLAS | Data: Edureka

IoT Applications in different industries:

Airline – An equipment tracking application provides an airline's engineers with a live view of the locations of each part of maintenance equipment. By increasing the efficiency of engineers, this IoT application is not only generating significant cost savings and process improvements, but also impacting the customer experience in an efficient way in the end through more reliable, on-time flights as well as optimal level of satisfaction. The next leader in the race for share of wallet is the Internet of Things (IoT)—networks of sensor-equipped, intelligent, exponential technologies that can gather data, interpret it, and take action on it by increasing the revenue while simultaneously improving the overall passenger experience.

Pharmaceutical – A medication temperature monitoring application uses sensors to detect if the medication's temperature has gone outside of the required range and ensures medical supplies still meet the quality standards on delivery. The handling of the temperatures are medications, vaccines for examples, is critical to their effectiveness. Internet of Things based smart applications can be used to not monitor that medications are kept within the proper handling temperature range, but also to remind patients about when it is time to take their medication. The evolving times demand faster and easier access to the healthcare services. At same time, the pharmaceutical organizations are also required to expedite safe and secure movement of drugs, clinical outcomes, better regulated transit and delivery. The need for speedy operations, invariably, falls down to harvesting data in a way that is both, well-organized and effective by required analytics.

Manufacturing – A lighting manufacturer for the horticultural industry built a Smart Application that can leverages IoT sensors and predictive analytics to perform predictive maintenance and the optimize lighting, power consumption and plant photosynthesis. The Internet of Things application transformed the business from a lighting systems manufacturer to a greenhouse optimization as-a-service business as well as value addition.

Logistics - In addition to production, Internet of Things can also help pharmaceutical companies figure out the logistics, shipping and the delivery conundrum. The path to smooth pharmaceutical logistics has been encountered with numerous challenges, given the complex requirements. By utilizing the low-energy sensors, pharmaceutical companies gain real-time visibility in the movement of goods. Besides, the sensors can also be deployed to smarten up warehousing and optimizing the routing. While in transit, Internet of Things can also be acknowledge for taking care of medicines, vaccines and other products. Certain vaccinations and medicines need to be maintained under specific range of temperature and variable physical conditions. Sensors in return, can ensure the same, while also monitoring the environment of these pharmaceutical products in real-time and reporting or managing any anomalies encountered the process.

Insurance – An insurance company offers discount to its policyholders for wearing Internet-connected Fitbit wristbands. The fitness tracking service is part of the insurer's Vitality program aimed at integrating wellness benefits of the life insurance.

Through this Internet of Things application, this insurer is creating smart life insurance products and rewarding customers for their positive actions by helping the organizations in a better way.

Business Services – A facility services organization uses their multi-device Internet of Things software to enable support personnel to receive the alerts about service issues and take immediate action if something serious is acknowledged. By aggregating data from thousands of sensors in devices like coffee machines, soap dispensers, paper towel dispensers and mouse traps rather than doing the manual inspections, the application has significantly cut the estimated costs and improved service levels.

Media & Entertainment – An entertainment design and production firm uses sensors in turnstiles of venues to understand the foot traffic of people at events and manages then in a secure way. Their Internet of Things application visualizes the attendee and the traffic patterns in real time to help sponsors understand the best places to advertise, and to ensure the attendee count stays within the fire code compliance of the venue so that best can be delivered by them as well as optimizing their profit also.

Conclusion and Future:

The monitoring and the controlling of machines in industry has become a major problem across the world The proposed system take few parameters related to industry and provide facility related to that [8]. IoT offers the countless benefits to the varied range of diverse areas which include medical, manufacturing, industrial, transportation, education, governance, mining, habitat etc. In the coming days, the entire globe will be connected by the IoT [9]. In the near future, we would not be able to imagine our life without IoT which will form an essential part of our day to day life. Indian market players along with the Government will need to focus on developments across Internet of Things 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 Internet of Thing policy, to develop the IoT market in India by 2020. India needs to continue to build capabilities across technology areas of sensors along with network infrastructure, standards and augmented intelligence and behavior. Various accelerators and incubators in India are enabling and empowering the start-ups to build innovative IoT solutions. Addressing current talent gaps in terms of cross-functional as well as specialized skill sets, is imperative for growth of IoT in India. Key stakeholders such as the Government, industry players and associations, need to collaborate to ensure successful adoption of IoT in India.

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