

## APPLICATION OF INTERNET OF THINGS (IOT) IN VARIOUS INDUSTRIES

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### Abstract

The high potential impact on people and the way of interaction with things makes IOT as almost widely accepted technology. The IOT technology implements the human imagination into reality. The usage of IOT products not only attracts the individual but many business enterprises are coming forward to implement IOT technology. In earlier days only computers have been connected to internet and data was transferred from one computer to another. Then laptops and smart phones are connected for easy communication. In next evolution people are being connected to each other through internet. Now a days internet are being connected to each and every things like Consumer products, durable goods, cars and trucks, industrial and utility components, sensors and other everyday objects. IOT is being considered to be third wave which connects devices, people environment, virtual objects and machines. The internet connectivity to these objects are connected to powerful data analytic capabilities which is capable of transforming the collected data and store for future use. Simply IOT devices will change the way in which people work and live in the future. In order to maintain the business process IOT are even used in the companies. This IOT will help in bringing changes in interaction of business, government and consumer with the physical world. The main objective of this paper is to reveal the application of IoT's in various industries. Further in addition to that the article also discusses about the benefits of this emerging technology with its limitations.

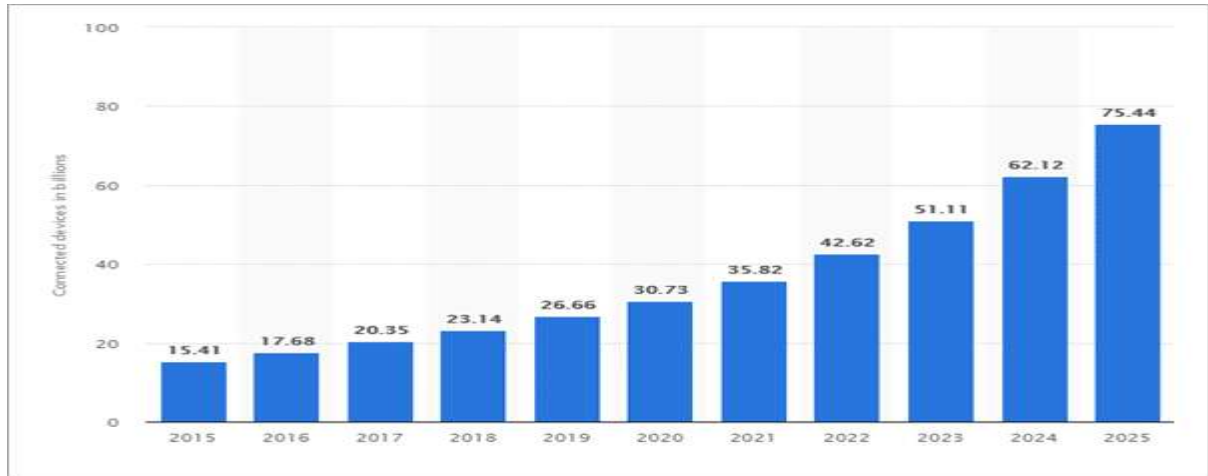
**Key words:** IOT, Applications, benefits and products.

### Introduction

Internet Of Things (IOT) is a device like TV, AC units, fans, doors and other physical objects or software connected to digital world that allow to access of things remotely. It is estimated that the internet and economy will be influenced by IOT. These days many IOT products had been developed for several purposes. Currently, IOT products and its usage are

increasing rapidly and many people are using it. IOT devices are not only connected to computer, laptops, smart phones, gadgets but also to smart cycles, smart doors, smart vehicles, smart security, smart cars, etc.,. Almost each and every one starting from youngsters till aged people are using smart phone.

**FIG 1 IOT devices - number of connected devices worldwide 2015-2025**



**Source: Statista Research Department, Nov 27, 2016**

The above Fig 1 illustrates the estimation of IOT devices till 2025. By the year 2021, nearly 35.82 billion IOT smart devices will come up and it will be used widely by many people. It was estimated that approximately 75.44 billion devices would be connected and by 2025 more than \$11 trillion global economic impact will be there. Further it was that predicted that (Chuck Martin, Staff Writer, June 11, 2017), in America each person will be having more than 10 IOT products of their own.

### **Objectives**

- ✓ To know the widely used IOT devices with its features.
- ✓ To ascertain the benefits of applying IOT by business organisation.
- ✓ To determine the application of IOT in various industries.

### **Important IOT devices**

#### **Air purifier**

Dust is present everywhere especially in home, office and other human environments which are unavoidable. According to the statement of Environment Protection Agency, indoor air is polluted by 2 to 5 times more than the outdoor air. This air pollution will lead to itching of eyes, sneezing, headaches, allergies, asthma, etc. In order to find solution for this air pollution, air purifier machine using IOT had been implemented. This purifier will purify the air in one particular place either home or office, even before the arrival of person when the purifier is ON using the application.

### **Smart watch for children**

In order to know the location of children, the smart watch can be connected to parent's smart phones. This may help the parent to identify where their child is right now or if they caught in the hands of unknown stranger or went to unknown place also they will be receiving the alert message.

### **Alarm**

For the purpose of carrying out the regular activities smoothly, few routine works can be connected with each other. For example alarm can be connected with coffee maker or heater or with any other devices to carry on further work without any delay. Even in coffee maker, minimum stock level can be set so that once the stock reaches it minimum, stock will be restored automatically.

### **GPS fleet tracking**

The IOT is used to monitor the vehicle health and also performance of the driver. Through this device if the driver is using the bark hardly or accelerating quickly, these activities will be automatically reaches the owner to have a control over usage of fuel using an application.

### **Voice control**

Using IOT the volume of audio or video can be reduced through smart phone, watch, tablet or computer. In case can't able to find the remote and important call is coming to mobile, volume of the audio can be muted through IOT.

### **Controlling lighting and appliances**

The appliances like doors, windows, water leaks, property of home etc., can be monitored and controlled through IOT apart from light through sensors. If everyone in the home or office left that place and having a doubt whether window has been closed or want to see whether rain water is coming inside the house. In this situation need not want to call the relative or neighbor to close the window. In that case one can make the changes and watch the home through the IOT itself. Using Wireless Video Monitoring Camera, one can monitor the properties also. Further, doorbell camera can be used to answer from anywhere and also captures the movement of human or an living organism.

Even the stock of household items like grocery, medicines, personal care products, etc., can be monitored. Using IOT device, if the items reach the minimum level, automatically restocked without any delay.

### **Smart lock**

People can sue this IOT device to keep away from thieves. One need not worry about missing of keys since unlimited digital keys are available. Further this smart lock will give the information of whether the door is locked properly or not.

## **Benefits of IoT applications in business enterprises**

Many people are benefited through the technology of IOT. Additional features motivates people to use the IOT product for various purposes. Through this IOT technology business has to change in order to collect data that are considered to be valuable and should in a position to innovate new usage of products. At last IOT had reduced the suffering of the organization and offers several benefits. Business enterprises try to impart the technology of IOT and enjoy the following benefits.

### **1. Cost reduction**

Competitive advantage can be maintained by the business in introducing the products at low costs. IOT technology can be used in manufacturing industries in order to monitor the machines which help to reduce the time spent on identifying the failure. Efficiency of electricity can be increased by savings energy costs by using this IOT technology. This technology helps to reduce the maintenance cost as every data is saved in the electronic device.

### **2. Improve productivity and increases efficiency**

In order to earn profit, each and every business aims to increase productivity and thereby enhancing the efficiency. Through this IOT, it is possible to predict the demand of the product and manage the production process. Various stages of production can be managed efficiently by tracking the raw materials, parts of the machine, etc., through applying real-time tracking system. Using IOT, possible breakdowns of machine can be predicted which may help to be ready with alternative solution. With the help of IOT it is quite normal to gather data and convert them into useful information. For example, in order to conduct meeting or any other important activity, the company needs to calculate employee productive hours of the employees which is possible through IOT. Like this feature, business can even use IOT for increasing management activities by informing the employees in advance about the technical disturbances, cleaning the work places and perform few automating routine functions of the business like fixing of sensors, making of coffee on time, etc.,.

### **3. Employee Training and safety**

Human beings are considered as an important asset of the business. The productivity of the organization can be improved through training given to the employees. Real time training is possible through this technology of IOT. Further this also offers good communication and better coordination with their clients. Thus it helps to minimize the disparity and the requirements were fulfilled quickly. Using this technology worker's safety and security can be ensured. The employee's work can be monitored continuously; any pit falls can also be identified and corrected immediately.

### **4. Business opportunities**

New business opportunities are opened through IOT. Business can communicate and interact with their customers in new way, production process can also be improved, real time employee training can be provided and even much more is possible. Through IOT, organization can expand the same business by adding additional features or can create new business / services using their existing customers itself.

### **5. Customer support and service**

Most important factor for the success of any business is customer without whom an organization will not exist. In order to retain the existing customers and bring new

customers, the organisation should identify the needs of the customer, satisfy them which helps to increase the profit. With the help of IOT, customer details can be collected and stored easily which helps for further analysis. Using this technology needs and preferences of customer can be identified instantly. IOT services that can be provided to the customers are smart trackers which allows the customer to track their orders, smart messaging through which customers will receive information of offers / discounts / customer points (Score) arrival of new products / establishment of new branches, etc.,. Using smart technologies the problems of the customer are solved easily and quickly.

#### **6. Miscellaneous benefits**

The business can get the past data and analyse, that too complete real time analysis which may used to predict the demand, analysis of post- production, customer and employees. Thus smooth production can be carried without any interruption. The organization can integrate the departments that may help to complete the work on time without any delay. In addition to all it provides solution to the transport and in warehouses also. Further IOT devices are connected with multiple products at a time.

#### **Application of IOT in various industries**

IOT technology can be effectively implemented in the following industries for smooth running.

##### **(i) Manufacturing industries**

In manufacturing industries, IOT can be widely used production department. In order to supply the raw materials without any delay, IOT devices are used to communicate about the stock level. Using this information, raw materials are reordered and restored. Further, IOT is also used to predict the demand, analysis the customer and supplier also.

##### **(ii) Automobile industries**

IOT can be used mostly in automobile sector for enhancing the internal features of the vehicle. For example, the car connected with IOT can perform its own operation and give the comfort for the passengers. Well established and branded companies like Tesla, BMW, Apple, Google, etc., are trying to use IOT technology for bringing biggest revolution in automobiles industries.

##### **(iii) Agriculture**

In each and every sector smart is emerging. As like of this smart farming has been introduced in the agriculture sector. In order to increase the food supply to meet out the increased population, government is taking initiative in introducing modern technologies to help the farmers. IOT is used in agriculture included soil testing, soil moisture, water control, fertilizer, pesticides, etc., IOT technology is even used in poultry in order to improve the production. This helps to monitor the health of livestock, identify sick livestock, providing medicines, checking weather condition, supplying of feeds / water / other requirements, etc.,.

##### **(iv) Retail sector**

In retail sector, the customers are easily connected through this IOT. With the help of smart phones customers are communicated about the offers, discounts, arrival of new product, customer points, tracking customer order, getting review / feedback about the products, find out the location of the customer, delivery of product, etc.,.

##### **(v) Mining industries**

This IOT helps to monitor the employees working in mining, their health condition, location, etc.,. Mostly employees working in mining sector gets affected

especially health or got struck in one place. Using these modern and advanced technologies it is possible to save their life's.

**(vi) Logistics**

In transportation sector IOT is used to track the location and speed of the vehicle can be monitored. There is less chance of fraudulent activity like theft of the product, supply of product, etc., if IOT technology is used in logistic sector. This also tries to solve the problems in warehouses, distribution centers and dispatch process.

**(vii) Smart city**

IOT technology is applied in creating the smart city. The application and usage of IOT devices in creation of smart city includes water distribution, monitoring the environment, energy management, smart observation, automated transportation, security, etc.,. This technology helps to solve the problems like pollution, traffic, water, municipal services, shortage of energy supplies, communication, electricity services, etc.,.

**(viii) Home appliances**

IOT technologies can be applied to refrigerator, air condition, doors and all other electronic devices. For example, if the room need to be in cool condition before the arrival, that is possible through this IOT. Similarly as like of this, IOT can be applied to all other home appliances also.

**(ix) Health care sector**

One of the emerging sectors in implementing the IOT technology is health care industries. During the COVID19, many new IOT products had been introduced for the safety of the people. The usage may include analyzing patients health, creating awareness, providing safety measures, suggesting medicine, communicating the availability of medicines, etc.,. Even smart watches has been introduced by including the features like checking of heart rate, steps of walk, treadmill, etc., for the benefit of the customer. On 21<sup>st</sup> October 2020,61 year old person life (Rajhans) was saved by the Apple Watch series 5's ECG features.

## **Limitations of IOT**

Though there are many advantages and opportunities, noteworthy criticism also exists in implementing IOT. Hacking, privacy / security, complexity, unemployment, dependency and compatibility were the main challenges of IOT. Apart from that in future there may be chances for technical issues and legal development. The following are the major drawbacks of IOT technologies.

1. There is high chance of leaking of data through IOT devices. Since the IOT devices are implemented through remote sensors, the privacy is open and can be viewed by all. But still the organistaion can protect the data by giving security from the initial period of development itself.
2. Lack of skills among the customer may leads to slow adoption of IOT products.
3. Still now there are no standard normsfor communication,monitoring the sensor and authentication is available. There is lack of authorization ofIOT products. Further auditing and logging standards are also not fixed.
4. The IOT devices are widely used which leads to increase in usage of data, makes data storage difficult. Data backup is problem when large amount of data is stored and there may be lack of data protection also.
5. There is chance ofhacking the personal information and can be misused.

6. The IOT may leads to confusion. For example, if the cartridge is connected to both husband and wife, then both will receive the message of minimum stock. There is two possibilities, one is husband may think that wife will buy and vice versa or both of them will buy.
7. Employment opportunity will be reduced when more and more IOT products are implemented. As everything is automated and done through machines there is no need human to transfer the communication which leads to increase in unemployment.

## Conclusion

Regardless of the size and industry, IOT is important technology that is used by all the firms. It is anticipated that IOT will be largely used by all the industries in near future and induces even the households to use it. Definitely high impact would be created in near future using this IOT technology. By this technology smart home and even smart workplace is possible. The company which uses the IOT will definitely has high growth than the company who fails to adapt to it. More challenges need to be faced while implementing IOT, even though it reduces the work of the company. Through this technology, each and every people involved in the business will be benefited. As it has both merit and demerit, this technology should be properly used by the user and it is upto the user to use it productively. This proper usage may lead to increase the profitability of the business and makes the customer more comfortable. Well said rightly by Meta S. Brown from Forbes, "The IOT's value is never greater than what management is prepared to do with it."

## Reference

- [1].Alansari, Z., Anuar, N.B., Kamsin, A., Soomro, S., Belgaum, M.R., Miraz, M.H. and Alshaer, J., 2018, August. Challenges of Internet of Things and Big Data Integration. In International Conference for Emerging Technologies in Computing, pp. 47-55.
- [2].Balakarthiga.M, Marketing Consultant, <https://scrape.works/blog/top-7-applications-of-iot-in-business/>.
- [3].Burhanuddin, M.A., Mohammed, A.A.J., Ismail, R. and Basiron, H., 2017. Internet of Things Architecture: Current Challenges and Future Direction of Research. International Journal of Applied Engineering Research, 12(21), pp.11055-11061.
- [4].Chuck Martin , Staff Writer, June 11, 2017, North American Consumers To Have 13 Connected Devices.
- [5].Ekim Saribardak 12/01/2018, IoT applications for businesses and benefits for the fleet industry, <https://www.geospatialworld.net/blogs/iot-applications-for-businesses/>.
- [6].Elly, Suzanne, April 05, 2018, 7 Ways the IoT Can Change the Business WorldBy Special Guest,<https://www.iotevolutionworld.com/smart-home/articles/437712-7-ways-iot-change-business-world.htm>.
- [7].Lee, I. and Lee, K., 2015. The Internet of Things (IoT): Applications, investments, and challenges for enterprises. Business Horizons, 58(4), pp.431-440.
- [8].Mainetti, L., Manco, L., Patrono, L., Sergi, I. and Vergallo, R., 2015, December. Web of topics: An iot-aware modeldriven designing approach. In IEEE 2nd World Forum on Internet of Things (WF-IoT), pp. 46-51.
- [9].Mohsen Attaran, July 2017. The Internet of Things: Limitless Opportunities for Business and Society, Journal of Strategic Innovation and Sustainability, Vol. 12(1) 2017.
- [10]. PrateekSaxena, 15 Jun, 2016, <https://e27.co/advantages-disadvantages-internet-things-20160615/>, The advantages and disadvantages of Internet Of Things.
- [11]. Ronak Patel, 10 January 2019, Glowid, Top 9 Benefits of IoT for Business Enterprises, <https://aglowiditsolutions.com/blog/benefits-of-iot-for-business-enterprises/>.

- [12]. Statista Research Department, Nov 27, 2016, <https://www.softwaretestinghelp.com/iot-devices/>, Internet of Things - number of connected devices worldwide 2015-2025.
- [13]. Suha Ibrahim Al-Sharekh , Khalil H. A. A-Shqeerat, February 2019, Security Challenges and Limitations in IoT Environments, IJCSNS International Journal of Computer Science and Network Security, VOL.19 No.2, 193-199.
- [14]. Technology Digital World , 21 March 2017, <https://www.bbvaopenmind.com/en/technology/digital-world/3-major-challenges-facing-iot/>, 3 Major Challenges IoT is Facing.
- [15]. <https://www.linkedin.com/pulse/why-iot-needs-fog-computing-ahmed-banafa?trk=mp-author-card>
- [16]. [https://www.internetsociety.org/resources/doc/2015/iot-overview?gclid=EAIaIQobChMI4JeKm-TH7AIVw3wrCh0sIwnTEAAYASAAEgL9p\\_D\\_BwE](https://www.internetsociety.org/resources/doc/2015/iot-overview?gclid=EAIaIQobChMI4JeKm-TH7AIVw3wrCh0sIwnTEAAYASAAEgL9p_D_BwE)
- [17]. <https://dzone.com/articles/iot-for-business-enterprises-attributes-challenges>, DZone > IoT Zone > IoT for Business Enterprises: Everything You Need to Know
- [18]. <https://www.juegostudio.com/blog/5-ways-in-which-businesses-can-benefit-from-iot-solutions>.
- [19]. <http://www.microwavejournal.com/articles/27690-addressing-the-challenges-facing-iot-adoption>
- [20]. <https://www.linkedin.com/pulse/wake-up-call-iot-ahmed-banafa?trk=mp-author-card>
- [21]. <https://www.linkedin.com/pulse/iot-implementation-challenges-ahmed-banafa?trk=mp-author-card>
- [22]. <https://sites.google.com/a/cortland.edu/the-internet-of-things/disadvantages>
- [23]. <https://www.analyticsvidhya.com/blog/2016/08/10-youtube-videos-explaining-The-real-world-applications-of-internet-of-things-iot/>