



## IoT Based Cars: A Paradigm Shift in Automobile Industry

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### ABSTRACT

The Indian automobile industry is one of the largest industry in the world. The Government of India and the major automobile players are working together to make India a leader in the two wheeler and four wheeler market in the world by 2020. Technological advancements have been reshaping the manufacturing industry. Internet of Things (IoT) is one of the new technologies based on connecting things to make communication among various devices via the sensors, actuators, internet etc. This technology has tremendous scope in future for changing world and the way we live. This is a review paper based on studying architecture, components, scope of internet of things (IoT) in the automobile industry and focusing on the car vehicle. Further study helps to identify the advantages, disadvantages and impact of this technology on automobile industry. By 2020 it is predicted that, new cars will be manufactured which is fully loaded with new technology.

**KEYWORD:** Actuators, Automobile, IoT, Internet, Sensors.

### 1. INTRODUCTION

The Internet of things (IoT) is an emerging technology in which objects are equipped with sensors, actuators; internet and a process communicate with each other for specific purpose. Today internet has become universal way for communication, which is touched almost every corner of the globe. We are entering in new era called "Internet of Things (IoT)". IoT is defined differently by different authors. Vermesan et.al.<sup>[1]</sup> defined the internet of things as interaction between the physical

and digital worlds via the sensors, actuators etc. IoT devices are equipped with sensors, actuators, processors for interconnection. The data is captured by the sensors, actuators which is stored and processed intelligently in order to derive useful interfaces from them. This data can be processed, shared via network or remote server for further action. The communication between IoT devices is mainly wireless because they are installed at geographically different locations. After receiving data action needs to be taken on the basis of the derived inferences.

### 2. Objectives:

1. To study present scenario of automobile industry in India
2. To study the concept of Internet of Things (IoT)
3. To study future scope for IoT in car manufacturing automobile industry.

### 3. Review of literature:

IoT has a significant impact on automotive industry. Automobile manufacturing companies, internet service providers, and software companies are coming together to build connected car system. Connecting car establishes communication between cars, with other car devices. Recently there are very less cars which are internet enabled but it is expected that the number will rise considerably in less than a decade's time.<sup>[3][4]</sup>

Infotainment refers to a system in vehicles that delivers a combination of entertainment and information service. Features of In-Vehicle-Infotainment (IVL) system are providing navigation features while driving, managing audio/visual

entertainment content, delivering rear-seat entertainment, connectivity with smart phones. [5].

Sensors such as Gyroscope or orientation sensor and accelerometer can be used to model the driving behavior. Using smart phone in vehicle, data from these sensors can be used to detect driving patterns such as sharp turns, sudden acceleration, hard braking, drifting and speeding. This technique helps to share driver's information with insurance companies for customized premiums. Pay as You Drive (PAYD) and Pay How You Drive (PHYD) are the upcoming use based insurances packages [6].

#### 4. Present scenario of automobile industry in India:

In the world Indian automobile industry ranked at 4th place with sales increasing by 9.5 % year by year to 6.02 million units (excluding two wheelers) in year 2017. Automobile industry is the 7th largest manufacturer of commercial vehicles in 2017. The growing interest of the companies in exploring the rural markets further aided the growth of the sector.

India is a prominent auto exporter and has strong growth expectations in the near future. Automobile exports from India grew at 6.86 percent CAGR between years 2013-2018. Further, several initiatives by the Government of India and the major automobile players in the Indian market are expected to make India a leader in the two wheeler and four wheeler market in the world by 2020 [8].

#### 4.1 Number of automobiles produced in India-

- The automobile manufacturing industry covers the production of commercial vehicles, passenger cars, three and two wheelers year by year.
- There is continuous growth in production from FY12 to FY18.
- It is observed that, total volume grew at a CARG of 4.43 % during years 2012 to 2017.

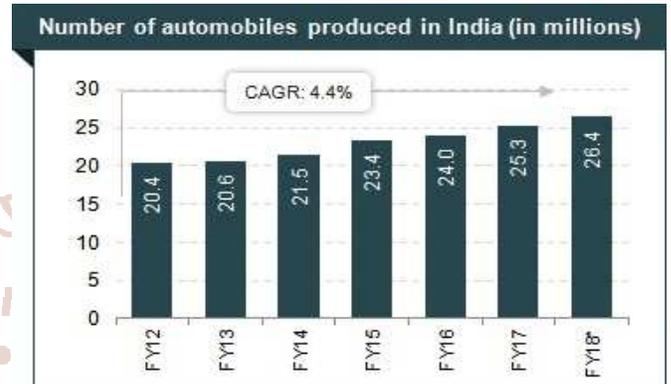


Fig-1 Number of automobiles produced in India (in millions)

Source: Society of Indian Automobile Manufacturers (SIAM),

Note: FY18- up to Feb. 2018

#### 5. Architecture of IoT:

Figure-2 shows the four stage architecture of IoT system. Stage 1 consists of sensors and actuators. Stage 2 includes sensor data aggregation system and analog-to-digital data conversion. Stages 3 consist of IT systems data processing before it moves to the data center or cloud. Stage 4 stored data is analyzed and, managed suitably for further process.

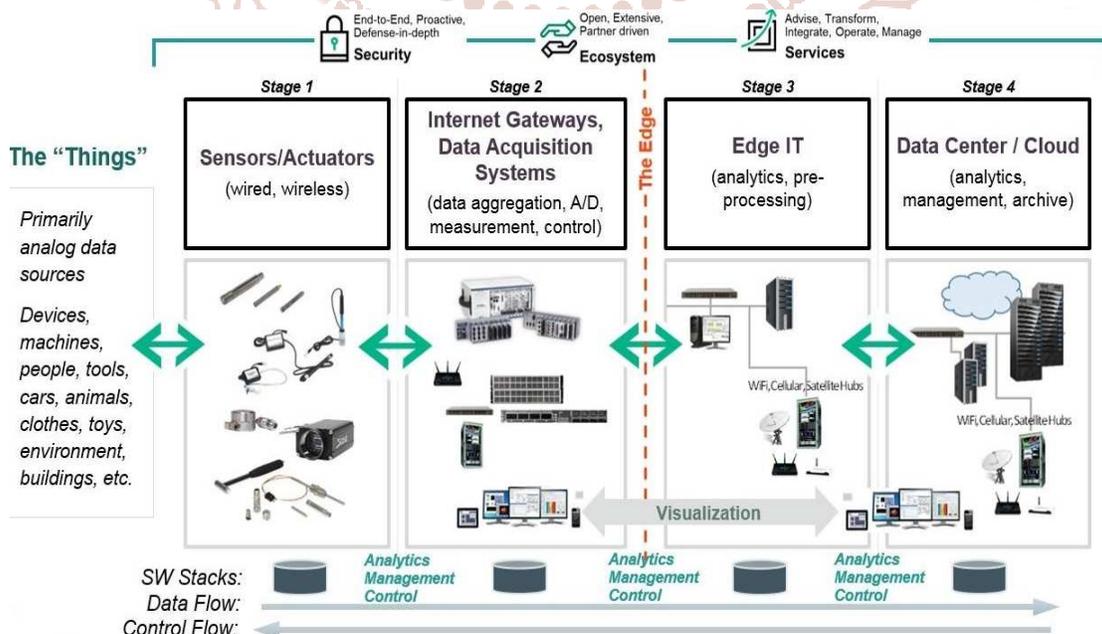


Fig-2. architecture of IoT (Source- <https://techbeacon.com/4-stages-iot-architecture>)

### 1. Sensors/actuators-

In this stage sensors collect data from the environment and turn it into useful data. Actuator is a device which can effect a change in the environment by converting electric energy into some form of useful energy. For example CMOS camera sensor for detecting speed restrictions, present lane departures, warn against obstructions, detecting oil leaks.

### 2. Internet gateways-

Data from sensor/actuator is in the form of analog signals. That data needs to be aggregated and converted into digital streams for further processing. The data acquisition systems connects to the sensor network, aggregates outputs, and performs the analog to digital conversion. The internet gateways receive the aggregated and digitized data and routed it via Wi-Fi, LAN's, and Internet to next stage 3 for further processing. Further intelligent gateways can build having capabilities like analytics, malware protection, and data management services. Such systems enable the analysis of data streams in real time.

### 3. Edge IT-

The data may require further processing before it enters in data center. Edge IT system performs more analysis. It is located in remote offices or other edge locations, but these sit in the facility/location where the sensors reside closed to the sensors, such as in a wiring closet. This stage concern with security, storage issues, data processing delays. Pre-processing of data, generating meaningful results and passing it to further stage can be done in this stage.

### 4. Data center and cloud-

In this stage data needs more in-depth processing and forwarded to physical data centers or cloud-based system, where more powerful IT systems can analyze, manage and securely store the data.  
[2]

## 6. IoT based smart car features:

IoT is new technology for car manufacturers introducing entire new layers to the traditional concept of car. it updates to smart car which leads innovative way to drive and stay in touch with the world at the same time. IoT protocols such as MQTT allows for interaction with different kinds of automotive equipment such as- sensors, control units, electronics, GPS, tracking system, traffic on road, other objects (car, vehicle etc.) such smart features are introduced in smart car design.



Fig-3 IoT based smart car features (source-<https://www.kaaproject.org/automotive/>)<sup>[12]</sup>

It supports following features-

1. Connected vehicle sensors
2. Real time car telematics tracking
3. Vehicle location tracking and scheduling solutions
4. Fuel tracking
5. Speed control
6. Vehicle leasing solution
7. Car leasing solutions
8. Fleet and driver management
9. Traffic management, workload management

### 7. Advantages of IoT:

1. IoT boosts the communication between devices. Therefore the physical devices are able to stay connected with transparency, lesser inefficiency and higher quality.
2. Automation and control are features of IoT, because of that physical objects getting connected and controlled digitally and centrally with wireless infrastructure.
3. More information helps making better decisions. All type information is gathered by the sensor which helps for better decision making for controlling car.
4. IoT saves time, money and adopt advance technology for better work done.
5. Automation and control are the unique feature of IoT by avoiding human interface. It also leads to uniformity in the tasks.

### 8. Disadvantages of IoT:

1. Compatibility is required for tagging and monitoring equipment.
2. Complexity due to failure in software or bug it will generate wrong output or information

3. Privacy and security of data because data is transmitted over network.
4. Lesser employment or unemployment issues in the society.
5. Increases the risk of dependability on technology which results lesser human control on system.

#### 9. Future scope of IoT in car manufacturing automobile industry:

- Car deals will go online
- Revolutionary changes in finance and insurance
- Evolution of driverless and electric cars due to advancement in artificial technology.
- Intelligent vehicle to infrastructure or vehicle to vehicle technology
- Connected cars will turn into hub of infotainment
- Use of navigation system like geographical positioning systems (GPS) or virtual positioning system (VPS) for location detection
- Pay As You Drive(PAYD) and Pay How You Drive(PHYD) are the upcoming use based insurance packages.

#### 10. Conclusion:

India is growing country and automobile sector is one of the leading sector. This industry also provides great opportunities for investment and direct employment to skilled and unskilled labor. By adopting new technologies in auto industry like Internet of Things (IoT) definitely there will be high demand for such techno savvy products. This technology focuses on automation which reduces time, cost, efforts, and money with high quality in process. Still there are some issues like security, privacy, and complexity etc. but it can be overcome with time.

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