

# The Influence of Industry 4.0 on Automotive Sector

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**Abstract:-** Technology has always witnessed multiple enhancements and changes in different forms and patterns in different industry and businesses. This has started with industrial revolution when more technical aspects were developed and included in industries for different types of improvements and enhancements. Industry 4.0 is the new term which is quickly gaining momentum. Industry has evolved in unique way recently and has redesigned the ecosystem entirely. The automobile business has accepted the Industry 4.0 and used the developments in production tools, smart finished products, information tools and analytics that use Internet of Things. The automobile-industry has turned and major boosts have taken place in the production area. Industry 4.0 has entered the world in which computerization and mechanization will come mutually in an altogether unique form, with robotics connected tenuously to computer technology well equipped with machine-learning algorithms that can control it significantly. This report contains detailed analysis of industry 4.0 and its position and collision on automotive-industry. The study is based on secondary data analysis and authentic sources are considered to understand the role and impact of industry 4.0 on automotive-industry.

**Keywords:-** Industry 4.0, Automotive industry, Growth of industry, Challenges.

## I. INTRODUCTION

It is imperative to survey the Industry 4.0 availability of mechanical ventures as the assembling area is right now confronting significant difficulties. These difficulties are viewing troublesome ideas like the IoT, digital actual frameworks or cloud-based assembling. Along these lines, expanding intricacy on all firm levels makes vulnerability about individual hierarchical and mechanical abilities and sufficient procedures to create them. A Foundation for mechanical designing, plant designing, and data innovation of German Engineering Federation (VDMA) has initiated a six-dimensional model to survey the preparation of the ventures, wherein VDMA specialists and some industry agents served in a warning limit in the advancement of the examination. The potential, particularly for Germany's mechanical designing industry and plant designing area, is extraordinary, both for providers and for customers of innovations across the range of Industry 4.0. Yet, there are yet numerous uncertain inquiries, vulnerabilities, and difficulties. The preparation study tries to address this need and offer understanding. It likewise features the difficult achievements that numerous organizations should in any case give the way to Industry 4.0 status.

The main issue in this arrangement is that the initial two measurements (smart factory and products) identify with the actual world, while the other two measurements (smart tasks and information-driven administrations) address the virtual portrayal of actual measurements. As per this idea, Industry 4.0 can be called as the combination of the physical and virtual universes.

Following are the significant developments in the auto business:

**Connected cars:** Connected vehicles will be vehicles associated with versatile organizations and give a wide scope of portability administrations. It is a vehicle that can improve its own activity and support just as give accommodation and comfort of travellers utilizing onboard sensors and internet facility. It is known that while the total cost of ownership might stay stable for customers, the dramatic expansion in-vehicle connectivity network may flood the estimation of the worldwide market for availability segments and administrations to €170 billion by 2020 from just €30 billion as of now. By 2030 it is normal that there will be more than 400 million connected vehicles on the streets worldwide, up from 23 million from the levels detailed in 2013. This sensational speed increase because of availability can possibly essentially change the current scene. With this evolving scene, very nearly 25% of purchasers from Brazil, China, Germany, and the United States previously focused on availability over highlights, for example, engine force and eco-friendliness. Acknowledgement of such vehicles in a few different regions is yet a test given the provincial contrasts, advanced security, and computerized protection. Additionally, the new vehicle purchasers are reluctant to dish out additional dollars for availability highlights. Different ventures have effectively incorporated the idea inside their own frameworks. For instance, insurance cost relies upon the determined distance (pay as you drive) of your driving pattern (Pay How You Drive). Then, smart watches inform drivers progressively about the vehicle's capacity, traffic, driver's profile metrical conditions. Moreover, GPS considers alarms and data coming from drivers, traffic, and frameworks. The application Geo limits the nearest parking spot and data about parking charges and so forth.

**Automated driving:** Autonomous is likely the term that best depicts the objective place of the innovation industry's pattern line. Real-time decision making is getting robotized at a consistently expanding pace. Also, the car business is no exemption and subsequently, autonomous driving is just the undeniable following stage. Autonomous vehicles are those wherein activity of the vehicle happens without direct driver contribution to control the controlling, speed increase, and slowing down. Such vehicles are planned with the goal that the driver isn't relied upon to continually screen the street while the vehicle is working in

self-driving mode. These vehicles utilize a blend of innovations to distinguish their environmental factors, including radar, GPS, odometer, and PC vision. Autonomous driving innovation highlights, for example, auto-braking, automatic parking, and versatile journey control which is also known as cruise control as of now are present in vehicles and completely autonomous vehicles are right now going through tests. By 2025, US\$ 42 billion cars are expected to arrive in the car market.

Numerous organizations are taking activities for building up this innovation. A few models: An American worldwide web search tool is working at creating self-sufficient vehicle innovations and has fabricated its own self-driving vehicle models. They have additionally built up the innovation utilized in three significant automakers. Another American worldwide automaker settled in Dearborn; Michigan is dealing with 'ride the green wave technology that could most likely end halting at red lights a few times each day. The green light ideal speed warning uses data on traffic signal timings from a side of the road unit to show to the driver, the best speed to venture out at to get a green light at the following intersection. An American overall online transportation network organization settled in San Francisco, California gained a self-governing truck start up for US\$ 680 million in August 2016 has likewise begun preliminaries for self-propelled taxis in Pittsburgh, United States. Other important examples are:

- Chinese e-commerce business organization with a motor corporation launched a sports utility vehicle including brilliant innovation in 2016
- German luxury vehicle manufacturing company is good to go to create completely self-governing vehicles by 2021.
- An American worldwide organization put US\$ 500 million in another American ride-sharing organization, to build up an incorporated organization of on-request independent vehicles.

The product lifecycle is the whole lifecycle of an item from the origin, through designing a plan and assembling, to administration and removal of made items. It coordinates individuals, information, cycles, and business frameworks. This cycle has been tied in with breaking the storehouses between designing, assembling, deals and showcasing, administration, and backing. Industry 4.0 will carry this life cycle to an additional degree of combination and intricacy.

## II. RESEARCH OBJECTIVES

- To study impact of Industry 4.0 on automobile industry
- To study the business opportunity of Industry 4.0
- To study future customer demand in relation to Industry 4.0 transition in automobile industry

## III. COMPONENTS OF INDUSTRY 4.0

Big data which is considered a major challenge as too much data makes it extremely difficult for identification of relevant information and latest trends/patterns that could lead to some intelligent analysis. This is where "Big Data" and "analytics" come in. Such analytics makes it relatively easy for the identification of performance of individual

components and its operating restrictions in order to prevent future issues in the production and helping in taking preventive measures.

Cloud computing the new advancements in technology at a continuous rate, machine learning and data functioning will shift to a safer cloud based solution. The cloud basically allows rolling at a much faster rate to get the latest updates, performance models, and delivery ideas than old traditional standalone systems.

Simulation is used to assess various scenarios. The moment those scenarios are assessed, cost effective solutions are developed, tested and planned to implement to reduce time and cost.

Augmented reality also known as (AR) uses real-time information in possible way permits the person to intermingle and coalesce with the systems in a much better manner. Such as in simulations or 3D views where it is used in various industries to get a better vision of the product or service.

Cyber security is the next step when everyone moves from closed system software or traditional method to increased connectivity from IoT and cloud. Security and dependability empower the fruitful execution of a really present day and digitized creation work process, utilizing the entirety of the recompense of connected environment.

System Integration is utilized as for the most part frameworks are exceptionally mechanized inside their own activities and find it difficult to speak with different frameworks. Principles and open engineering support the simple exchange of data both to the business and to the client/end client.

Additive manufacturing keeps on getting progressively significant for little bunch applications or for the establishment of individual parts or customized items. This will be utilized either straightforwardly with the client or by providers to improve plans with expanded execution, adaptability, and cost adequacy.

## IV. CURRENT INDUSTRY SCENARIO

A mechanical change is seen which could be filled by the headway of advanced innovations. Tentatively, the combination of physical and virtual universes into a digital actual framework may tremendously affect each component of assembling and auto area. In contrast with Industry 3.0, the conventional enterprises anticipate extraordinary level of incorporation between data, correspondence and assembling frameworks available to them, including:

- Smart sensors which allow industrial IoT to allow real time data collection.
- Huge data transfer broadband which allows big data to be communicated between machine, humans and production sites.
- Cloud computing which gives us the freedom to store huge data at any location
- Data analytics which permits tremendous volumes of information to be handled cooperatively

It can be correctly said that Industry 4.0 is a combination of troublesome computerized innovations that are set to change the assembling area past creative mind, driven by bewildering ascend in information volumes, framework mixes and network, development of cutting edge investigation and business insight capacities, machine learning's, enhancements in the exchange of advanced directions to the actual world.

**V. BENEFITS FOR THE AUTOMOTIVE INDUSTRY:**

The leaders of supply chain in every area have realized that the industry 4.0 offers immense benefits, which shows a gigantic impact on organizations bottom line. Yet it gives remarkable benefits to the auto business:

- **The agile supply chain:** The suppliers and original equipment manufacturers (OEM's) in the automobile industry are dependent upon progressive rigid fuel guidelines. The outcome: a push for light weighting to build efficiency. Industry 4.0 status likewise gives OEM's and the suppliers the readiness to adjust to manufacturing specifications in response to changing standards.
- **Self-Monitoring Capabilities:** As the factories move towards a 24 hour creation, equipment reliability turns out to be significantly more important. Industry 4.0 empowered plants will have vigorous checking frameworks to distinguish potential upkeep issues before they cause downtime. The same technology could be used in automobiles themselves to decrease unexpected breakdowns.
- **Capacity of customization:** Today drivers are in an awe to always customize their vehicles. Moreover, the traditional automobile manufacturing doesn't allow such customization as it is not part of the process. But now, the industry 4.0 has bought such a change that this gives the manufacturers the ability to customize and also shorten the delivery time for those vehicles.
- **Network Flexibility:** Automobile manufacturers have their base set up all over the world. The industry 4.0 manufacturers are also connected to these locations. If the demand fluctuates or production hampers, operations can shift among facilities as required.

**VI. CHALLENGES FOR THE AUTOMOTIVE INDUSTRY**

An evolution like this does tag along some key challenges that an automobile manufacturer might need to overcome to remain competitive.

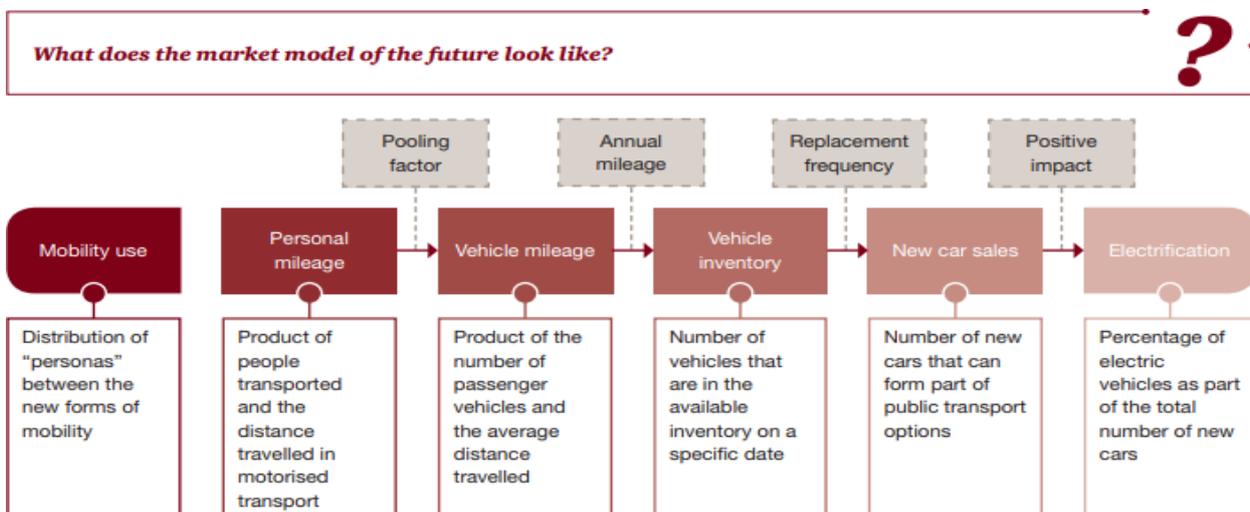
- **Contractor integration:** Automobile industry depends intensely on contracted assembly, which considers more noteworthy adaptability to address the short term demand changes. Incorporating those contactors in supply-chain management with start to finish visibility can introduce some trouble.
- **Data Security:** The current business model addresses a closed information circle, where the data doesn't leave the organization. Industry 4.0 calls for opening the circle, which makes each manufacturing endeavor vulnerable against cyber security threats. This is extremely dangerous considering the customers could endure genuine damage if their connected vehicles are hacked.
- **Data Management:** The time of Big Data has shown up, and the car business produces enormous volumes of information. While cloud computing tends to address a straightforward issue of data storage, many automobile manufacturers are still coming up with saddling their information to gain useful insights. They need to strategize, and use logistics management that includes complex analytics and appliance learning so that algorithms can help them have clear view of the data.

To conquer these difficulties, the automobile industry needs to push towards automation and visibility across the supply chain. This could provide them with a valuable structure, and choose right strategies with right tools to achieve industry 4.0 availability. ERP or logistics software needs to be measured on the foundation of its capacity of holding principles of Industry 4.0

**VII. DATA ANALYSIS AND INTERPRETATION**

*A. How is global automotive market changing?*

Due to industry 4.0 causing a dramatic change in the business world, the automobile industry is following a new change in their approach.



• Note: The personal mileage depends upon the habit of the automobile. The higher the mileage, the more people tend to look for more options. This is where car pooling comes into the picture. This allows to look for more initiatives in developing vehicles with friendly mileage variants. This causes them also to make options open for production of public transport if mileage is so important according to customers. Since mileage played a huge role in developing and production of cars, electric cars entered and further percentage increased worldwide.

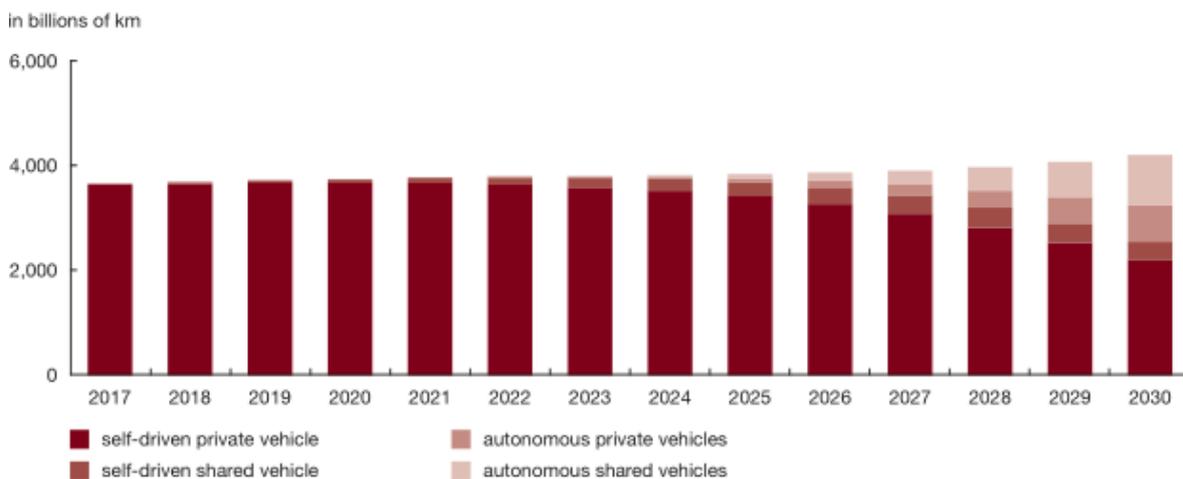
Personal mileage and Vehicle mileage increase is important in making new automobiles for the future:

Individual mileage and vehicle mileage represents a central issue of the model. The connection between these two figures – as alluded to momentarily above – is controlled by the average occupancy of the vehicle. Concerning the issue of shared and independent, this is depicted as the pooling factor. This represents the higher occupancy pace of a shared vehicle like uber POOL.

The fundamental beginning figure for portraying mobility in a nation is personal mileage. Separated into the types of mobility directed by the use conduct of the personas, the mileage frames the reason for ascertaining vehicle stock and furthermore by implication for computing the quantity of new vehicle deals. Explanations behind the rise in personal mileage are population growth and an augment in the motorization rate just as changes in relative and absolute mobility costs. Forecasts for these and other full-scale financial elements decide the credibility of the patterns, expecting generally steady financial advancement in the three-nation inspected in the research paper.

More individuals can take part in the motorized individual vehicle through autonomous and shared vehicles. Elderly individuals, those with physical incapacities, the population groups on low livelihoods and those without a driving permit – particularly children and youthful individuals – can effectively take an interest and hence adding an increase to the personal mileage.

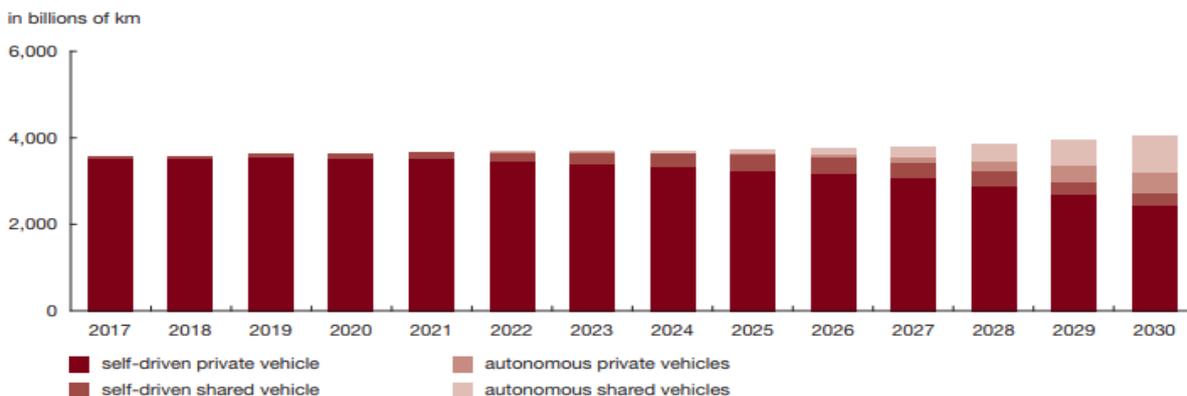
**Fig. 15 Europe: Vehicle mileage (2017–2030)**



In Europe, practically 3.7 trillion traveler vehicle kilometers are at present voyaged. At a normal occupancy pace of 1.3 people per vehicle, this adds up to practically 4.8 trillion individual kilometers voyaged each year. Inhabitation

rates differ as per the type of versatility. With shared vehicles, we start by accepting a higher pooling factor. In 2030 the vehicle mileage in Europe could arrive at 4.2 trillion kilometer.

**Fig. 16 US : Vehicle mileage (2017–2030)**



As of now practically 4.7 trillion traveler vehicle kilometers are gone in the US every year. At a normal inhabitation pace of 1.3 people per vehicle that makes an absolute yearly mileage of 3.59 trillion traveler vehicle kilometers. The vehicle mileage could ascend as high as six trillion kilometers.

### VIII. FINDINGS

- The future development of industry 4.0 and consequence of automotive industry will require synergetic efforts as everyone in the ecosystem need to boost reliability and deliver massive benefits.
- The uses of 3D printing, robotics and other IT tools can aid the automotive industry to enhance product design production and supply chain inefficiencies.
- The automobile industry needs to shift towards complex products made in minimal time. This can be achieved through industry 4.0.
- Industry transition will create a platform where labor will account for small proportion of overall manufacturing costs and cost advantages in low cost countries will decrease rapidly.
- The mobility usage will change as the upcoming developments of the social person has shown that sovereign and communal vehicles will be much more prevalent by 2030.
- Electric vehicles by 2030 will be 95% in production with customer's eye on them.
- Industry 4.0's transition means a hit to the traditional suppliers and manufactures as the upcoming years will be extremely crucial for them. Those suppliers and manufacturer will have to countenance vicious competition with further automobile new generation manufacturers. This is because the falling margins while simultaneously making investments in electronic mobility and customer orientated innovations whichever trend is in demand.
- The reorientation of the business can be depicted through analysis that mobility habits will change, personal and overall mileage of vehicles will increase and vehicles are expected to be applying more rigorously.
- The car inventory might decrease in future due to high costs but vehicle demand and sales will extend possibly. Electrification and autonomous driving will be mutually beneficial in Industry 4.0.
- Connected cars are the future along with shared cars, electrified cars, and autonomous cars. From the customers point of view these so called electric cars would make driving easy, cheaper, comfortable.
- This revolution has forced the automotive industry into reinventing itself till a certain extent.

### IX. CONCLUSION

The Industry 4.0 has got such a transition in the industries that eradicating the use of paper and huge organisms to simply linking everything through IoT, helping to bringing collaboration among IT and OT, and is capable to introduce effective aspects of organization and managed quite easily with a touch, is a unique element for multiple people to implement. The main objective of this research was to find out and review what industry 4.0 is and the way automotive sector have reached here. The report intends to demonstrate the future improvement of the market, beginning from the client. The more the generation steps into the world of digitization, the more automotive companies will tend to evolve and enhance themselves in spending tons in R&D, customer friendliness, budget friendly cars etc. which suits the tech savvy customers. When we focus on changes in mobility, or structural changes, we need to think about civilization. This kind of fundamental change demands the primary energies of our people in society to contribute, learn, and trust the process.

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