

Implications Of Artificial Intelligence In Manufacturing Industry With Special Focus On Automotive Manufacturing (Cars)

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ABSTRACT

Machines can learn and repeat the pattern of choices that are made by humans by carefully recording and analyzing the human behavior on various aspects. Intelligence basing on this is named as Artificial Intelligence (AI) and that came as bliss to the human kind and reduced the risk and efforts in increasing the productivity. Many verticals implemented AI in production and achieved productivity with growth. Automotives are also utilizing this AI not only in manufacturing/production process but are expanding its application in producing automotives to enhance the driving experience of the customers.

Keywords: Manufacturing, Artificial Intelligence, Machine learning, Automotive

1. INTRODUCTION

Manufacturing is the word derived from the words Manu and factum from Latin and Manufactura from Italian word which means 'made by hand'. In other words man made. As the production process changes from time to time people use to adopt new tools and machinery. From 17th century the word manufacturing replaced the work done by humans. Usage of machinery in place of human beings was started slowly from this time.

Machinery made the work easy for humans by reducing their efforts and time in producing the products. Slowly the work started getting automated using coded machinery which will complete the work with a simple click of button. Though the tools and machinery are automated and can work efficiently than humans they are not smart enough to make decision in manufacturing/ production.

In 21st century the branch of science and technology brought into lime light, the concept of Artificial Intelligence, where the machines learn and apply some specific patterns, called as machine learning. By machine learning a machine can interpret and record the decisions for a pattern and act accordingly. Artificial Intelligence (AI) proved to the world that machines also can learn and make decisions which are administrative.

Slowly this new technology so called Artificial Intelligence attracted the attention of world of manufacturing and was adopted in almost all manufacturing industries.

Artificial Intelligence is the replica of human intelligence in machines, that are designed to make decisions like humans and show the human traits like learning and problem solving ^[6].

Manufacturers are forcefully embracing AI-based arrangements and administrations to reshape their business activities and by increasing their profits. The choice of automation in assembling line is on the growth facilitating new doorways and upgrade operational abilities by utilizing new innovations, reliable procedures and making companies versatile to adopt the changing business operations. Understanding the reality, different manufacturers are putting efforts robustly to harvest the benefits in exceptionally unique and serious market situations. With approach of Industry 4.0, expanding immense and complex measure of dataset, and rising selection of mechanical IoT in a few enterprises are a portion of the key components driving the development of the AI in manufacturing market^[9].

In light of industry vertical, automotive manufacturers specially car manufacturers are said to have the major utilization of the general AI in manufacturing market in 2019. The enormous portion of this section is fundamentally credited to the developing interest for self-sufficient vehicles, reception of the developed cars addresses the quality administration of the vehicle and maintenance by knowing in advance about the damaged parts or the parts that are ready to be replaced. Artificial Intelligence empowers applications that length the car producing floor.

Man-made intelligence helps to overcome numerous unseen difficulties that lay in manufacturing. Starting from lack of aptitude to unpredictable issues associated with coordination, and complex data. Utilizing AI in assembling units empowers organizations to totally change their procedures.

Automakers can utilize AI-driven frameworks to make plans and oversee work processes; empower robots to work securely close by people on manufacturing plant floors and mechanical production systems, and unique parts going into vehicles and trucks. These abilities can assist makers with reduced expenses and personal time underway lines while passing on best products to customers ^[4].

2. LITERATURE REVIEW

A. Stork (2012) revealed that “Virtual assembly training systems show a high potential to complement or even replace physical setups for training of assembly processes in and beyond the automotive industry”^[1].

Sreelekha (2018) in her work mentioned the challenges faced by companies using AI like confusion with data handling, expensive, and security concerns ^[11].

Jay Lee (2018) developed AI eco-system for manufacturing industries which gives a clear picture for strategies to be implemented for meeting needs and challenges while transforming to AI systems. The model used four technologies Data, Analytic, Platform, and Operational ^[7].

E S Soegoto (2019) has given an simulation model of driverless cars using ‘Deep Learning’, the technology by which computer makes decisions by its own. Algorithms were combined with artificial neural networks, which helps the system to understand complex concepts. This technology is used for industrial era 4.0 to produce driverless cars to avoid crashing and for parking ^[3].

Shubham Sen (2018) identified the challenges in modern automotive manufacturing which lead to the usage of AI. The challenges identified are Vehicle accidents, Theft, Driver Distractions, and Maintenance scheduling. How AI is going to answer these questions were also discussed in the paper ^[10].

3. OBJECTIVES OF THE STUDY

- To highlight the direct and indirect benefits of implementing AI in Manufacturing
- To discuss the impact of AI on the growth of various verticals in manufacturing with the help of future projections.
- To give an insight on world companies adopting AI in Automotives with focus on car manufacturing.

The present paper tries to explore the benefits of AI and how AI is going to change the manufacturing numbers.

4. IMPLICATIONS OF ARTIFICIAL INTELLIGENCE

Following are some of the benefits of using Artificial Intelligence

DIRECTED AUTOMATION

The usage of AI and robots is mainly seen in assembling. Automation of assembling is changing the path of large scale manufacturing. Robots can do repeating exercises, planning the creation model, rising fitness, building mechanization arrangements, removing human blunder and conveying unrivaled degrees of value affirmation ^[5]. All these activities are performed with zero error.

24X7 PRODUCTIONS

People have to work in shifts to ensure continuous flow of production, where robots can work all day in the manufacture line. This makes the Organizations to extend their manufacturing abilities and fulfill the needs of the clients around the world ^[5].

SAFER OPERATIONAL ENVIRONMENT

With a few blunders occurring on the assembling plant, a stage towards AI implies less human interaction to do hazardous and excessively hard work. As robots replace people and perform ordinary and hazardous exercises, the quantity of accidents at work place will be reduced. ^[5]

NOVEL OPPORTUNITIES FOR HUMANS

As AI being adopted in assembling plant and customary human undertakings, laborers will get the opportunity to concentrate on creative and innovative assignments bringing changes in the way they work. i.e., while AI deals with incompetent work or regular and routine work during this people can concentrate on innovative design development and steering their business to cutting edge levels to gain competitive advantage ^[5].

REDUCED OPERATING COSTS

In spite of the fact that, bringing AI onto the assembling business would require an enormous capital speculation, the ROI is also high. As shrewd machines begin dealing with everyday exercises, organizations can

get impressively lower working expense. So much of money spent on training the new workers in every aspect can be saved^[5].

INCLUDED BENEFITS OF AI

Artificial intelligence and modern mechanization have progressed significantly in the ongoing years. Artificial intelligence encourages and permits machines to accumulate and remove information, recognize designs, learn and adjust to new things or situations through machine knowledge, learning and discourse acknowledgment.

The underlying advantages that come with AI are:

- Create fast information decided choices
- Facilitate upgraded manufacturing results
- Advance procedure viability
- Minimize expenses
- Facilitate versatility
- Facilitate product improvement
- Reduced Employee turnover rate

Besides, AI is very acceptable at understanding the regular language and interpreting it, this will end up being less complex for laborers and supervisors to speak with programming^[5].

5. CHANGING NUMBERS IN MANUFACTURING BY AI

According to an article published by plant automation-technology on its website it is projected that by 2035 companies can witness 40% of increase in their production by using AI *Table 1* shows the statics across 16 verticals listed below in

1. Information and Communication
2. Manufacturing
3. Financial services
4. Wholesale & Retailing
5. Transportation and storage
6. Professional services
7. Healthcare
8. Construction
9. Agriculture, Forestry and Fishing
10. Accommodation and Food services
11. Utilities
12. Arts entertainment and recreation
13. Social services
14. Public services
15. Other services
16. Education

Table 1 : Statics regarding the projection of growth by 2035 across the manufacturing verticals

Vertical	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
With AI	4.6	4.5	4.7	4.5	4.3	3.9	3.7	3.8	3.8	3.5	3.3	3.4	2.9	2.6	1.8	1.9
Without AI	3.8	2.3	2.8	2.3	2.5	2.7	2.6	2.5	1.8	1.7	1.6	1.8	1.9	0.8	0.9	0.8

The above statistics are graphically depicted in Figure: 1

The effect of AI on industrial growth

Real annual GVA growth by 2035(%)

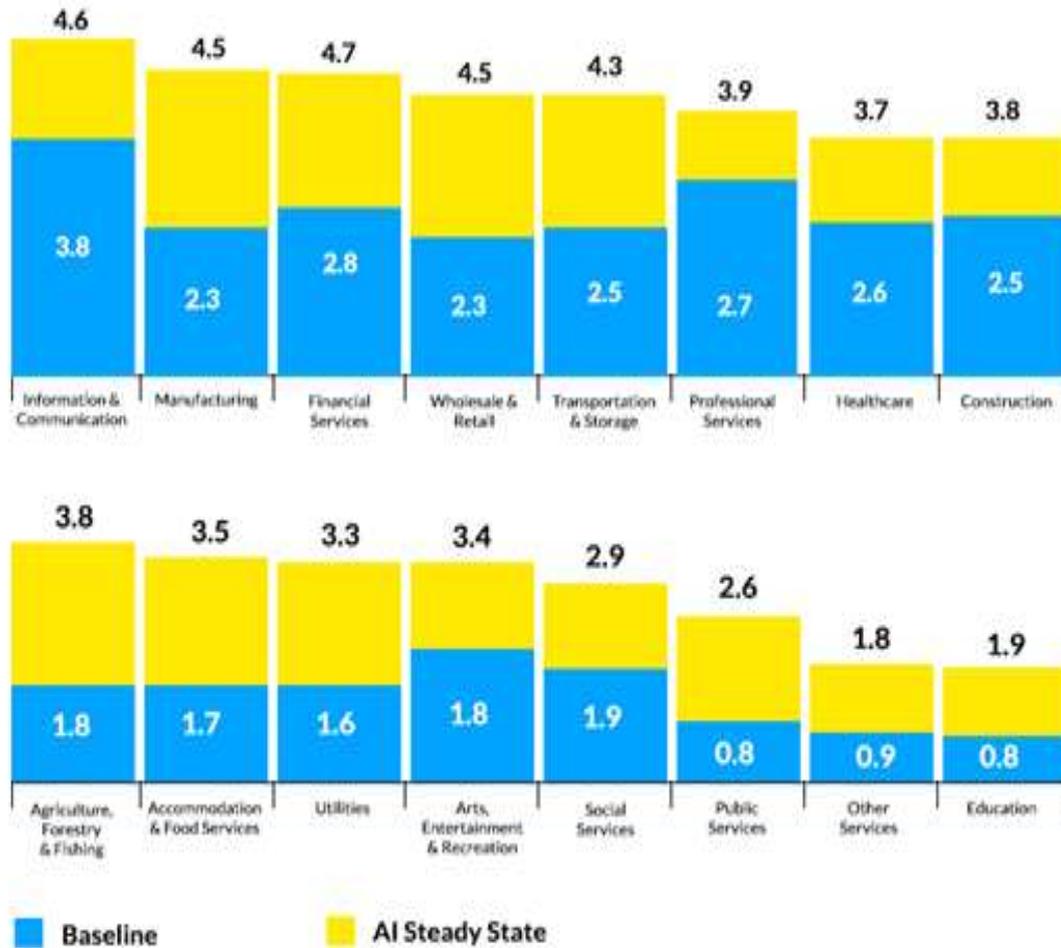


Figure 1: showing the projections of the profit growth across the industry with and without adopting AI

Source: <https://www.plantautomation-technology.com/articles/the-future-of-artificial-intelligence-in-manufacturing-industries>

According to survey by 2035 a great value is added to the Manufacturing sector where the base line projection in manufacturing is US\$ 8,397 billion are raised by US\$ 3,776 billion with a cumulative of US\$ 1,398 billion in Intelligent Automation, US\$ 2,071 billion in Augmentation and US\$ 307 billion in total factory productivity (TFP) which is more than 40% of the baseline and the figure 2 shows the graphical representation of this projections¹.

Great Value Added in 2035 (Manufacturing)

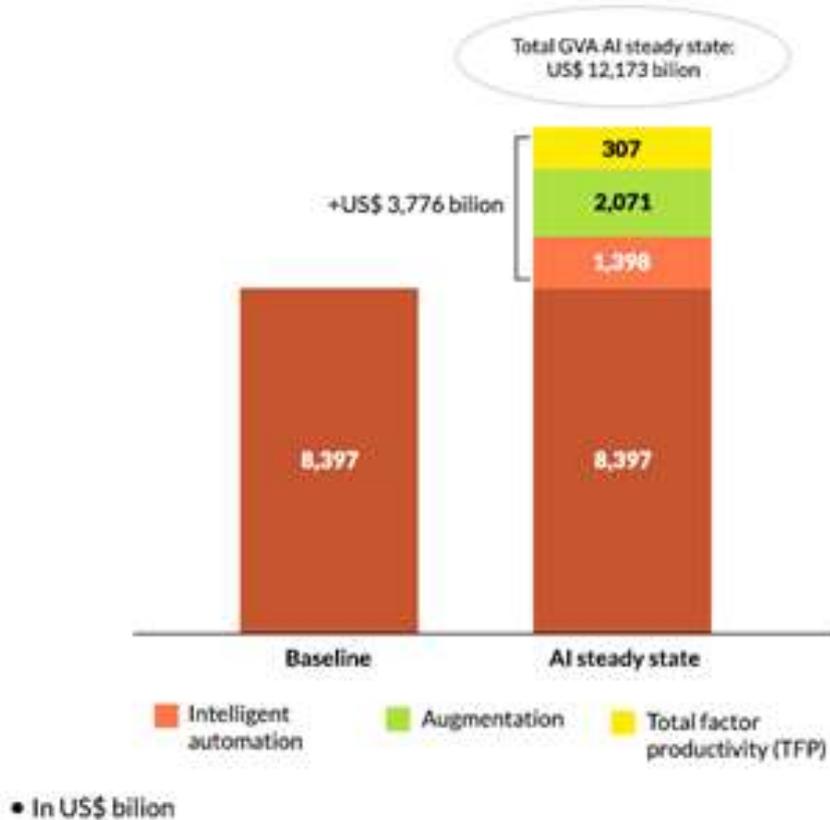


Figure 2: Projections in raise of manufacturing by 2035 using AI in their process

Source: <https://www.plantautomation-technology.com/articles/the-future-of-artificial-intelligence-in-manufacturing-industries>

6. IMPACTIONS OF AI IN AUTOMOTIVE MANUFACTURING

In manufacturing industry apart from manufacturing use case for AI presently spread the whole driving experience. Here are a portion of the differing manners by which car producers are utilizing AI convey a more secure, increasingly effective driving experience while smoothing out their procedures to contain costs with latest applications of AI are

Driver help – It is one of the cutting edge AI application highlights a significant number of features which are accessible in the present vehicles and trucks in this AI frameworks assist drivers to unsafe street conditions, screen vulnerable sides in the driver's view, help with controlling, and take robotized activities to assist vehicles with keeping away from accidents and hazardous circumstances.

Autonomous vehicles — in the car business, independent vehicles are the new sacred goal. Producers and their innovation accomplices are striving to create AI-driven frameworks to empower complete self-driving vehicles and trucks. These frameworks join a wide scope of AI-empowered advancements, for example, profound learning neural systems, characteristic language preparing and motion control highlights, to give the minds to vehicles that can securely drive themselves, with or without a human driver ready.

Connected vehicles — AI is a fundamental innovation for associated vehicles. For instance, AI can look for and anticipate segment disappointments, so vehicle producers and proprietors can work proactively to maintain a strategic distance from issues. It can likewise furnish drivers with area based data and customized publicizing to assist them with finding the things they need. Likewise, AI-empowered frameworks can send driving and mishap information to insurance agencies, which may offer motivating forces for safe driving propensities^[12].

7. AUTOMOTIVE COMPANIES SPECIALLY CAR MANUFACTURING COMPANIES USING AI WORLDWIDE AND THEIR INNOVATIONS

Nutonomy a car manufacturing company is making self-ruling innovation by name nuCore for totally driverless Automotives that takes into consideration adaptable and human-like vehicle taking care of (without the mistake). The product empowers the car vehicles to explore even the most unpredictable traffic circumstances.

Autox car manufacturers are making retail-based self-ruling vehicles. The organization's vehicles consolidate AI programming, sensors, constant cameras and a huge number of test miles, both virtual and genuine, to guarantee safe choices out and about^[2].

Drive.Ai Name Company is using man-made consciousness to change current transportation frameworks with self-driving administrations. The vehicles are not just self-governing, they likewise speak with drivers and people on foot inside the region, and for example, showing a sign to walkers demonstrating it will sit tight for them to cross^[2].

Optimus Ride is a self-driving vehicle organization that makes self-governing vehicles for geo-fenced areas. The organization's brilliant, electric vehicles empower the usage of progressively productive and reasonable urban areas, opening up leaving, restricting the measure of vehicles out and about and diminishing ecological effect^[2].

Zoox - While a few organizations are equipping existing vehicles with self-driving abilities, Zoox Company is making their own independent vehicles without any preparation. The vehicles are being created to be an automated rideshare vehicle. Like current transportation administrations like Uber or Lyft, a client would gather a Zoox vehicle for a ride through an application on their Smartphone^[2].

Google always adopted latest technology to delight its customers, in this path Google launched Waymo into autonomous market and is planning to launch a public car service where a customer can hire a vehicle through an app on their mobile. For this Google has used combined technologies of GPS, lidar (light radar), radar, high-res cameras to operate the vehicle.^[8]

Tesla one of the renowned brand for electric vehicles has entered into automated vehicles, unlike Google they used sonar technology in the place of lidar. The project is in testing phase once it is approved we can drive fully automated car from Tesla.^[8]

CONCLUSION

New innovations in technology not only make the human efforts minimal but also benefit the organizations numerously and it is evident from the researches that manufacturing industry will witness higher growth rate in the next one and half decade by adopting Artificial Intelligence in production. Automotive industry has not only seen increase in productivity but also changed the whole experience of driving to its customers with innovations in assisting its drivers and commutates. On the whole AI will come with additional benefits than what is looks from external.

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