Artificial Intelligence (AI) in Manufacturing

A K Jha

***Abstract*: There is no doubt that over 60% of manufacturing companies are using AI technology. AI in manufacturing cuts downtime and ensures high-quality end products. Moreover, manufacturing companies are applying AI-based analytics solutions to their information systems for improving work efficiency.**

AI in manufacturing will have a crucial impact on the smart maintenance of the production environment. To avoid sudden damages to machinery, manufacturers are predictive solutions. These AI-enabled solutions for manufacturing companies can predict the failure of equipment before they get damaged.

Similarly, artificial intelligence in manufacturing also helps manufacturers to get faultless products to market on time. Thus, AI in manufacturing impacts product quality and ensure profits.

***Keywords*: Artificial Intelligence (AI), Manufacturing Industry**

Top 10 uses cases of AI in manufacturing industry
The uses of AI in the manufacturing industry are incredible. Industrial AI robot collaboration enabling manufacturers to deliver generative products faster.

AI in the manufacturing industry is changing the way manufacturers design products. The AI solutions for manufacturing offer insights into the best design. Similarly, AI offers manifold benefits to manufacturing companies. Herein, have listed the best 10 significant benefits of AI in manufacturing.

#1 Quality Checks
Internal defects of equipment cannot be detected easily. Sometimes experts are also unable to detect the flaws in products by observing their functionality. But, AI and ML technologies can do this efficiently. Minor flaws in machinery are detected with AI.

AI in manufacturing processes improves quality control. Smart AI solutions monitor the productivity of machinery. That's why most of the manufacturing companies using AI automation in their manufacturing routines. AI-based tools detect defects of products on the production line.
USM has developed equipment maintenance AI solutions.

#2 Predicts Equipment Failure
Manufacturers face challenges with machinery failures. A product might look perfect from the outside, but it offers low performance when we use it. It affects productivity.

It is the second most reason behind the increased demand for AI in manufacturing. Manufacturing companies are deploying AI to get information of equipment damages for ensuring excellent performance.

#3 Equipment Predictive Maintenance
Predictive maintenance of devices allows the manufacturer to cut device maintenance costs. Using ML-powered predictive solutions, AI tools for manufacturing predict when machinery require maintenance services.

Similarly, cloud and the IoT sensors are also playing a vital role in modernizing the manufacturing industry. They embedded in machinery to better predict the maintenance and overcomes equipment issues that have to occur in the future.

AI services and applications for manufacturing helps to achieve smart manufacturing operations and reduce cost overheads.

#4 Digital Twins
Digital twin visualizes the infrastructure, products, or services. It pairs up virtual and physical attributes for analyzing vast data collected by sensors or cameras. The ultimate goal of the digital twin is to design and test equipment virtually.

#5 Supply-Chain Management
The use of artificial intelligence in supply chain management is rapidly increasing. The technology is gaining momentum across supply chain management operations. Machine learning, natural language processing, computer vision, robotics, and speech recognition makes supply chain management tasks smarter.

AI has multiple applications in supply chain management. They include:

- **Establishes a strong communication channel among departments**

Thus, the best communication channel among teams helps to improve overall business performance.

- **Warehouse management & logistics**

Artificial intelligence tools and apps can optimize warehouse management and logistic operations. From production to delivery, everything can be analyzes using AI. AI-enabled devices and tools that can also manage and track fleet operations efficiently.

- **Development of autonomous vehicles for logistics**

Artificial Intelligence in manufacturing is going to its next level in the form of autonomous vehicles. To better manage the distribution centers, the manufacturing companies are investing in AI-powered autonomous vehicles to automate the logistic operations.

Hence, together with artificial intelligence robotics and tools, self-driving vehicles reduces dependency on human drivers. A big thanks to artificial intelligence technology.

AI-driven machines are laying an easier path to the future by yielding a bunch of benefits – offering new opportunities, enhancing production efficiencies, and bringing machine interaction closer to human interaction. The Fourth Industrial Revolution is knowledge-based work, carried out by the automation; by creating new ways to automate tasks, we can rebuild the way people and machines live, interact & collaborate, to make a superior, stronger digital economy.

AI facilitates to conquer many internal challenges that have been around in the industry: from expertise shortage to complexity in decision making, issues related to integration, and overloaded information. Making use of AI in manufacturing plants enables businesses to completely transform their proceedings. Let's have a glance at how AI is helping the manufacturing sector to accomplish:

- **Directed Automation:**

The utilisation of AI and robots is particularly observed in industrial manufacturing as they revolutionize mass-production. Robots are capable of doing recurring activities, designing the production model, rising competence, building automation solutions, eradicating human error and delivering superior levels of quality assurance.

- **24x7 Production:**

While humans are forced to work in 3 shifts for ensuring continuous production, while robots are capable to work for 24/7 in the production line. Businesses can be witnessed to expand in terms of production capabilities and meet the high demand of customers worldwide.

- **Safer Operational Environment:**

With several errors taking place on the manufacturing plant, a step towards AI means less human resource have to carry out dangerous and overly laborious work. As robots replace humans and perform normal and risky activities, the number of workplace accidents will decrease all across.

- **Novel Opportunities for Humans:**

As AI takes over the manufacturing plant and automates boring and ordinary human tasks, workers will get to focus on complex and innovative tasks. While AI takes care of unskilled labor, humans can focus on driving innovation and routing their business to advanced levels.

- **Condensed Operating Costs:**

Although, bringing AI onto the manufacturing industry would necessitate a huge capital investment, the ROI is significantly high. As intelligent machines start taking care of day-to-day-activities, businesses can enjoy considerably lower operating cost.

Added Benefits of AI

AI and industrial automation have advanced considerably in the recent years. Development in machine learning techniques, advances in sensors and therefore, the growth of computing power has helped produce a brand new generation of robots. AI helps allows machines to gather and extract data, acknowledge patterns, learn and adapt to new things or environments through machine intelligence, learning and speech recognition. Using AI, manufacturers will be able to:

- Create rapid, data determined decisions
- Facilitate enhanced production outcomes
- Advance process effectiveness
- Minimize operational costs
- Facilitate superior scalability
- Facilitate product development

Moreover, AI is quite good at understanding the natural language and translating it, this will turn out to be simpler for workers and managers to communicate with software. For example, software users often have a preference to look for things rather than navigate a complex menu. AI makes the software comprehend the user's intentions, which make the system more spontaneous, which leads to superior output and fewer errors.

The Affect AI in the Manufacturing Industry

The manufacturing industry has always been available to embrace the innovative technologies. Drones and industrial robots have been a part of the manufacturing industry since 1960's. The following automation revolution is just around. With the implementation of AI, if organisations can keep inventories lean and reduce the cost, there is a high probability that the Manufacturing Industry will encounter an empowering development. Having said that, the manufacturing sector has to be prepared for organized manufacturing plants where supply chain, design team, production line, and quality control are very coordinated into an intelligent engine that provides noteworthy insights of knowledge.

The Trends of Manufacturing Industry with Emerging AI:

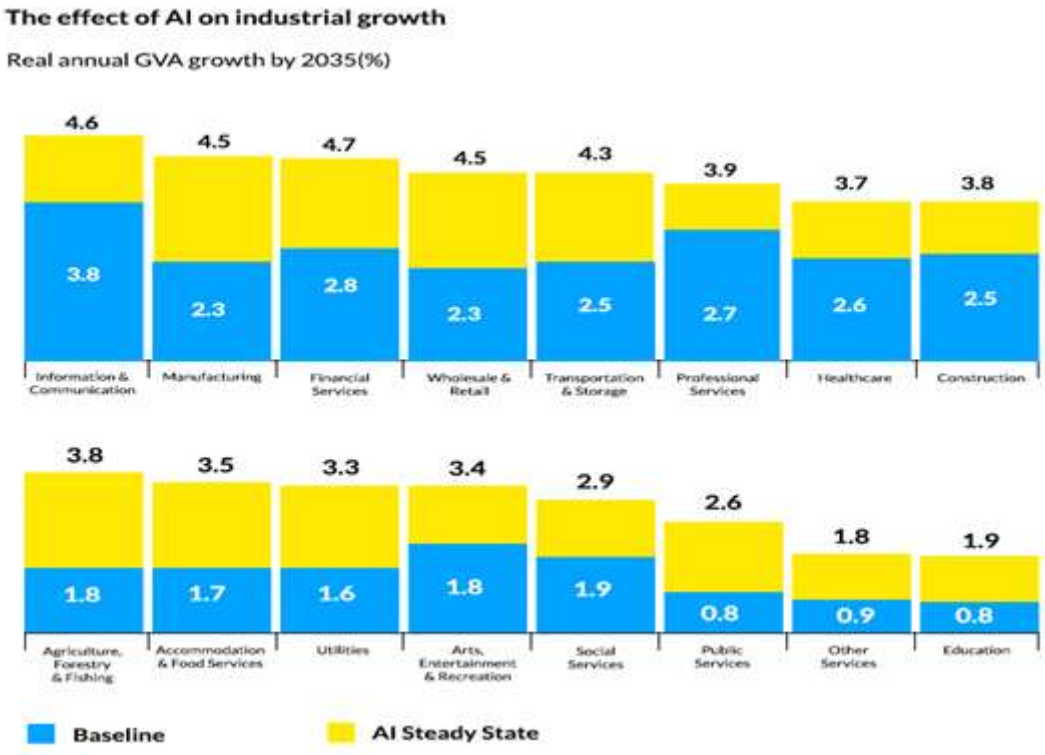
AI will impact manufacturing in ways we have not yet anticipated. Nonetheless, we can already look at some more noticeable examples.

The continued enhancement in computer visualization has long been used for quality assurance by detecting product defects in real time. But now that manufacturing involves more information than ever integrated with the fact that plant managers do not want to pay employees to enter information—AI with computer vision can rationalize how information gets apprehended. A factory worker should be able to acquire raw materials reserve from the shelf and have the stock transaction created automatically based on a camera observing the process. This will be the natural user interface, just carrying out the task at hand not inputting or scanning things into a system.

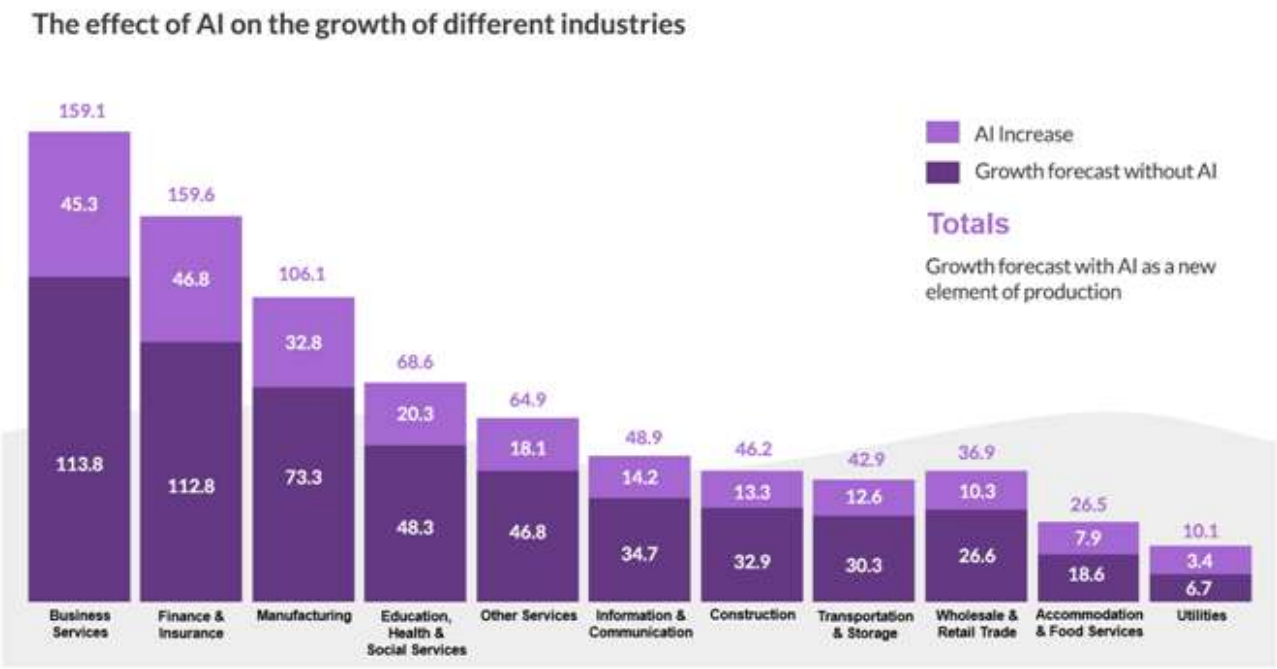
Secondly, AI will impact is with the Internet of Things (IoT). IoT will give a way to deliver supplies and services to customers who might not comprehend that they are required. Additionally, IoT can send in-depth telemetry back to producers and distributors to scrutinize quality and factors that might drive failures. In brief, IoT is an inward tsunami of information that AI can utilize to reason over and evolve. This will facilitate augmented generative design processes where products are re-imagined in ways more similar to evolution.

Some Important Statistical Information of AI in Different Sectors:

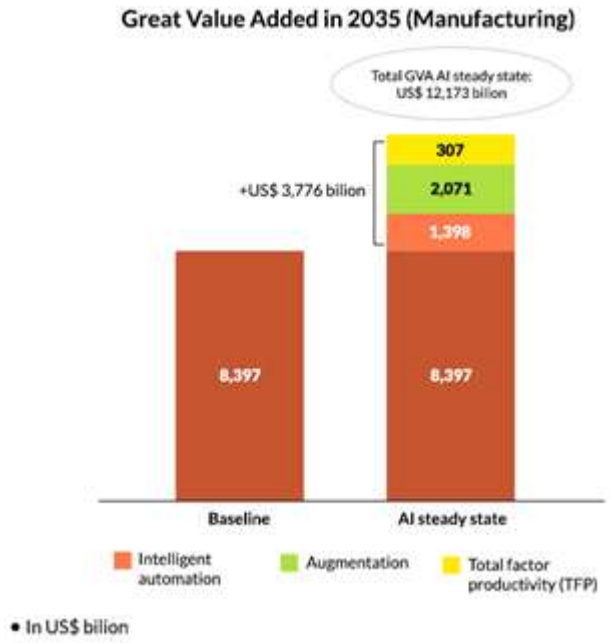
- By 2035 AI technologies have the impending to rise in production 40% or more.
- AI will boost the economic growth an average of 1.7% across 16 industries by 2035.



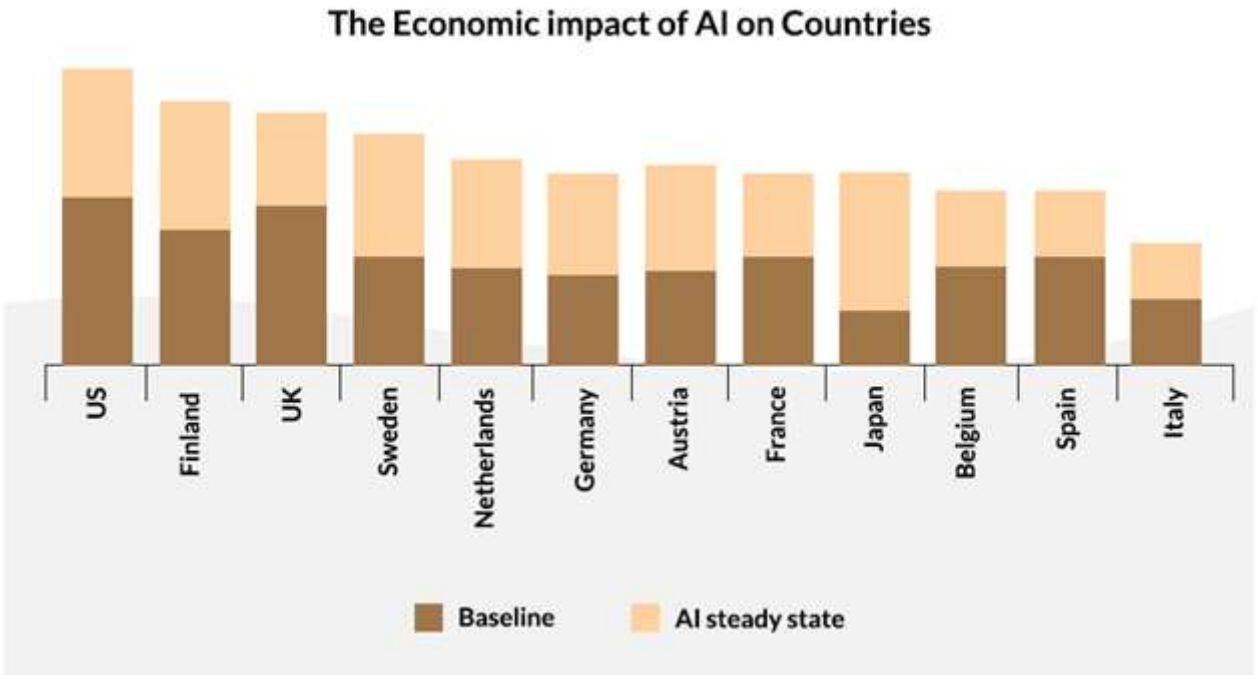
The bar chart illustrates the growth forecast with AI as a new element of production:



Great Value Added in 2035 for with respect to the Manufacturing sector




The effect of AI on Industry Profits
Share - of - profit rise in every industry between standard levels in 2035 and AI balance levels in 2035 (%)
82%
Education
72%
Accommodation & Food Services
76%
Construction
57%
Wholesale & Retail
54%
Healthcare
51%
Agriculture, Forestry & Fishing
44%
Social Services
41%
Transportation & Storage
36%
Manufacturing
38%
Other Services
34%
Financial Services
24%
Public Services
24%
Arts, Entertainment & Recreation
22%
Professional Sevices
15%
Information & Communication
8%
Utilities


The Economic impact of AI on Countries
US
Finland
UK
Sweden
Netherlands
Germany
Austria
France
Japan
Belgium
Spain
Italy
Baseline
AI steady state

Conclusion

AI's proponents claim that the technology is only an evolutionary form of automation, a predictable result of the Fourth Industrial Revolution. AI may be efficient at creating things, improving them, and making them cheaper. But there is no replacement for human ingenuity in dealing with the unanticipated changes in tastes and demands—or in deciding whether to make things at all.