



THE RISE OF ROBOTICS IN MANUFACTURING: REVOLUTIONIZING EFFICIENCY AND PRODUCTIVITY

Abstract

The integration of robotics with sensor technology, artificial intelligence and machine learning has led to a transformation in the manufacturing industry. The ability to deliver high-quality and customisable products with high efficiency, reduced costs and overheads makes robots indispensable to manufacturing processes in the years to come.

The coming years will see companies across industries making huge investments in robotics. Companies are investing billions of dollars to boost productivity, quality, and efficiency, and save on labour costs. According to a McKinsey survey, 25 per cent of capital spend will be towards automated systems. The story is no different in the manufacturing industry, where automation has been around for many decades. Manufacturing automation refers to employing technology and equipment in production processes, with the end goal being to improve efficiency and productivity while reducing costs and overheads. In recent years, robotics has become synonymous with manufacturing automation. While robotics has been around for many years, there is now a “robot revolution” taking place, which is transforming the manufacturing industry. With advancements in technology, robots have evolved from performing repetitive and hazardous tasks to becoming “intelligent”, learning from prior experience and adapting based on needs. Industrial robotics has now scaled new heights, leading to flexibility and agility, while aiding the production of increasingly complex, sophisticated and customised products.





How robotics is influencing manufacturing

The manufacturing market is constantly evolving. Simple automation is taken for granted, and robotics is paving the way for new possibilities in manufacturing.

Mass customisation: Mass customisation of products involves tailoring a mass-produced product to meet individual needs without compromising on the time to deliver. Manufacturers gain a competitive advantage while grabbing opportunities for increased revenue and customer satisfaction. Robotics can add great value to mass customisation even at low volumes. By deploying robots that are powered by artificial intelligence (AI), companies can deliver custom products without the overheads of additional cost and time. Using templates designed by experts, robots can produce customised products at a fraction of the cost typically required for customisation. For example, a shoe manufacturer can offer several custom designs based on a common template, which can quickly be brought to fruition by using robotics in production. With the flexibility offered by autonomous mobile robots (AMR), car manufacturers can use the same assembly line to make a sedan, minivan, or SUV. Customisation is done for functional purposes too, such as producing custom soles for running shoes or producing customised 3D-printed hearing aids that ensure a perfect fit for a person.

Addressing labour shortfall: Industrial automation is also driven by a shortage of labour across several countries. Plunging birth rates in several countries across the globe including the US, Japan and Italy are leading to a labour drought. The COVID-19 pandemic only added to the shortage of skilled workers with several thousand jobs being lost in the industry. Additionally, the industry faces hiring issues due to tough working conditions, a lack of flexibility and low wages. By 2030, the US manufacturing industry alone is expected to have a shortfall of 2.1 million workers. Manufacturers are turning to automation to fill the gaps. While robots do the lower level, repetitive and labour-intensive work, enterprises can hire workers to perform higher-order tasks requiring human intervention.

Improving workplace safety: With employers increasingly concerned about providing safe working conditions, robots are being deployed in dangerous and high-risk environments that endanger workers. For example, with automation, manufacturers can provide “no-touch” environments by deploying controls that let workers operate equipment in dangerous conditions and stay out of harm’s way. Robots can also be used in conditions that are perilous for human beings – such as extreme amounts of dust, high temperatures or high noise levels.

Manufacturers are also deploying robots to reduce the stress of repetitive motion on workers. For example, if a worker is constantly bending over to fix screws, nuts, or bolts, it can lead to stress injuries. Instead, such work can be fully or partially automated, also improving the efficiency and accuracy of the process. Repetitive work is often monotonous and can lead to poor worker awareness, resulting in higher errors and safety concerns. Instead, robots can do humdrum tasks, letting employees be more productive. This results in higher quality products, less hazardous working conditions, and happier employees.

Sustainable manufacturing: The manufacturing industry has a significant impact on the environment due to the high utilisation of energy and resources, generation of waste and effluents, and emissions. Environmental sustainability is a vital issue for manufacturers. Robots can contribute in different ways to green manufacturing. Workers tend to tire out due to tedious or intensive labour, which leads to defective products, and wastage of material. With robotic automation, manufacturers can streamline processes and reduce excessive resource consumption by installing sensors on equipment and real-time monitoring. For instance, using sensors for sanding equipment and automatically replacing sandpaper optimises the utilisation of

resources in a highly intensive sanding process. Robotic automation also reduces energy consumption. Human beings require temperature-controlled environments which are comfortable for them. On the other hand, robots can function in a wider temperature range. Workers need not commute and can operate from a centralised workplace, reducing the need for transportation, which results in energy savings. With automated storage and retrieval, manufacturers can store goods in vertical racks and optimised shelving that reduces the need for space and increases energy efficiency.

Driving reshoring: Countries are moving towards self-reliant models owing to the recent pandemic and geopolitical uncertainty across the globe. Trade tensions and lockdowns can result in non-availability of raw materials and labour shortages, resulting in delayed delivery of finished goods. Entire supply chains can be disrupted when manufacturing operations are offshored. As a result, many companies across the globe are looking at reshoring. According to the Society of Manufacturing Engineers (SME), 69 per cent of industrial companies in North America will reshore production and sourcing.

Robotic automation will be necessary for companies to scale up production, and maintain quality, profitability, and efficiency.

Modern manufacturing is inextricably linked to robots. Integration with rapidly advancing technology such as artificial intelligence (AI), sensors, and 3D modelling will further enhance the capabilities of robots. By delivering precise and high-quality products at reduced costs and increased efficiency, robotic automation* is expected to change the face of manufacturing.

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