

# Rise of Robotics:

## How AI and Automation Are Transforming Industries, Reshaping Jobs, and Redefining the Human Role in the Future of Work

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### **I. Introduction**

Not long ago, the notion of AI taking over the world was just a mantra for science fiction movies. However, it's no longer science fiction - we are experiencing a rapid shift of natural intelligence being overrun by artificial intelligence and automated systems quickly becoming more effective than human-operated systems.

According to Robson, the compound annual growth rate for robotics engineering is around 24% between 2021 and 2026 (Robson, Rapid Growth of the Robotics Industry). Meanwhile, by the end of 2025, around 85 million jobs are predicted to be taken over by AI, becoming more automated (Elad, AI Job Loss). Despite this statistic, engineering and robotic jobs will stay strong. Rather than relying entirely on AI-driven solutions, we can focus on human-AI collaboration to enhance our quality of life.

### **II. Manufacturing**

Manufacturing is one of the most heavily impacted industries when it comes to robotics integration. As automated systems improve, manufacturing jobs begin to drop due to the implementation of robotics systems and automation. Even though automated systems increase efficiency and lower costs, they will begin to cause significant job loss. As stated in Mitsubishi Electric Automation, "30% of US manufacturing jobs are likely to be automated by 2030" (Mitsubishi Electric Automation, Inc.) For example, assembly line automation has caused robots to outperform humans in repetitive manufacturing tasks by completing them with greater speed and fewer errors. As a result, a single AI-powered machine can replace multiple human workers. Although AI will help us speed up our manufacturing process, it will also cause job displacement and will especially affect low-skill jobs.

### **III. Agriculture**

Just as robotics is shaping manufacturing, in agriculture robotics can be used to help solve labor shortages and boost productivity. Farmers often struggle to find seasonal labor workers during harvest times, which can lead to slowed labor, crop waste, and financial loss. However, automated harvesters, like those used in strawberry and apple farming, can work continuously, no matter the conditions. This not only reduces dependency on human labor, but farmers are also able to respond more quickly to market demands. A good example of agricultural robotics is SharpShooter by Verdant Robotics. This technology is made to precisely apply weed spray to crops using only the right amount for each plant. This will both cut labor costs by 85% and help minimize waste for farmers allowing them to recoup their investment within 6 to 18 months (Verdant Robotics).

### **IV. Healthcare**

Healthcare mixed with automation can improve precision, safety, and patient care. Most surgeries come with a lot of risk of human error, especially in delicate procedures such as brain surgery.

Robotic systems like Da Vinci robotic surgery are advanced assistant surgery devices used to enhance a surgeon's dexterity during an operation. A system like Da Vinci's can reduce recovery time and minimize surgery complications. This technology does not replace doctors, as it is a highly skilled and educated field, but it empowers them to achieve successful outcomes.

## **V. Military**

While robotics in military and defense can be a controversial topic, the applications of robotics enhances mission safety and tactical advantage. In the military, soldiers deal with all sorts of weapons in high-stress environments. For weapons that include explosives, using EOD (Explosive Ordnance Disposal) robots will help detect, disarm, and dispose of explosive threats and protect lives while maintaining a strong tactical stance. By implementing robotic systems into such a stressful position, the military can focus more on strategy and decision-making rather than exposure or direct risk of survival.

## **VI. Space Exploration**

Space missions depend on robotics for exploration, maintenance, and survival in harsh environments. Planetary rovers like Perseverance and many others can explore surfaces humans can't reach yet. Since space is currently unreachable for long-term human space exploration, organizations like NASA have built automated robotic systems with various sets of data-collecting sensors to roam Mars. Machines like the Perseverance rover can drive through Martian terrains to collect data and send it back to Earth. These rovers function fully autonomously for long periods and perform tasks that are too dangerous for humans.

## **VII. Customer Service**

Hospitality industries are using robotics to improve service consistency and reduce staffing challenges. Autonomous vacuum and cleaning bots can maintain public areas efficiently. Hotels often are faced with issues related to maintaining cleanliness and delivering timely services with limited staff. Cleaning robots, like autonomous vacuums and floor-cleaning robots, can operate around the clock to keep public spaces clean. These robots would help improve efficiency and allow human staff to focus on customer service and other tasks that would raise overall hotel and guest experience while lowering operating costs. Aside from AI assistant robots, a hotel in Japan called Henn Na Hotel is a partially autonomous hotel where humanoids and dinosaurs greet you at the front, robotic porters carry your luggage, in-room robots control lights, TV, and AC, and recycling robots take care of your trash.

## **VIII. Retail**

Retail automation is streamlining customer service and inventory management. Autonomous checkout systems can reduce wait times. Long checkout lines and stock inaccuracies frustrate both the customers and employees. Autonomous checkout systems and shelf-scanning robots address both issues by reducing wait times and maintaining inventory accuracy. These technologies free up employees to engage more directly with customers, improving the shopping experience while optimizing store operations.

## **IX. Education**

Robotics plays a growing role in education, offering both learning tools and research automation. Limited access to STEM learning tools can hinder academic progress. Robotics kits teach students problem-solving and programming, while lab automation systems handle repetitive tests, allowing researchers to focus on innovation. These technologies support both foundational learning and advanced discovery, making education more interactive and efficient.

## **X. Conclusion**

Robotics is transforming the modern world to maximize efficiency in how we live and work. From manufacturing industries to education, the integration of robotics and automated systems has already boosted the productivity and reliability of many jobs. By implementing robotics in different areas, we can open opportunities to focus on the more important tasks at hand.

Although some jobs may be affected negatively, embracing this change will allow us to direct our human workforce toward other jobs that can benefit and improve our quality of life.

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