1. Describe Technology

Justification of the topic + importance and the opportunities for society

Industrial robot is a robotic arm that is automated to perform specific tasks that are hard, dangerous, or too monotonous for humans.  There are four main components that make up the robotic arm. These components are manipulator, controller, end effector and teach pendant. Manipulator is the arm that moves and rotates on various axis. Controller is the computer system that connects to the robotic arm to control its movement, rotation, and effector functions. End-effector is the device that is attached to robot’s wrist which allows it to interact with the given task. These interactions include welding, handling, packaging, picking, placing, dispensing, and cutting. The Teach Pendant is the device used to program industrial robots’ movement, rotation, and end effector function.

Robots help increase productivity in the workplace. Once a robot has been automated in an industrial environment, it can speed up production by decreasing the completion times and creating more efficient manufacturing processes which convert into more profit. According to the information on International Trade Administration's website, adopting industrial robots has led to growth in productivity. Among all industries, a one percent increase in quantity correlated with an increase in productivity of 0.8 percent.  Within the United States, industrial robot installation increased at 10.28% compound annual growth rate in the past decade, from 15,170 in 2008 to 40,373 in 2018. According to economic research analyst Kara Mazachek, it was found that parts of the industry with easily automated labor and financial resources have the most robots. These industries include automotive, transportation, metal, and wood manufacturing industries. Largest productivity gains were seen in industries where companies were in early stages of adopting robots. These industries saw 5.1 increase in productivity with an increase in industrial robot density of one percent.

Industrial robots provide precise and quality work by reducing probability of human error and exhaustion. The automation increases the efficiency of production and helps ensure that the process of the function doesn’t alternate. Robots also provide efficiency while simultaneously lowering the production costs. BCG (Boston Consulting Group), an American global management consulting firm analysis found that using advanced robots can reduce conversion costs by up to 15%, and combining advanced robotics with other technologies, process enhancements, and structural layout changes can yield savings of up to 40%.

<https://www.youtube.com/watch?v=Cndodc3X50s>

<https://www.bcg.com/publications/2019/advanced-robotics-factory-future>

<https://blog.trade.gov/2020/12/22/robots-and-the-economy-the-role-of-automation-in-productivity-growth/>

Risks posed ​

As the number of industrial robot installations grow, the employment rate in industries with easily automated labour will likely begin to decline. The tasks are performed much quicker and more precisely by robots than human workers.   In the article "Robots and Jobs: Evidence from U.S. Labour Markets", published by MIT professor Daron Acemoglu, the researchers found that for every robot added per 1,000 workers in the U.S., wages decline by 0.42% and the employment-to-population ratio goes down by 0.2 percentage points — to date, this means the loss of about 400,000 jobs.  Between 1990 and 2007, the increase in robots (about one per thousand workers) reduced the average employment-to-population ratio in a zone by 0.39 percentage points, and average wages by 0.77%, compared to commuting zones with no exposure to robots. This implies that adding one robot to an area reduces employment in that area by about six workers.

Chart, line chart

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<https://mitsloan.mit.edu/ideas-made-to-matter/a-new-study-measures-actual-impact-robots-jobs-its-significant>

<https://economics.mit.edu/files/19696#:~:text=We%20study%20the%20effects%20of,and%20local%20indus%2D%20try%20employment>.

https://www.sciencedirect.com/science/article/pii/S0040162520310283#:~:text=The%20average%20unit%20labor%20cost,level%20in%20manufacturing%20(%2417.5).

Choices, currently available offerings for IR

##### **“Effect of Covid 19 on Robotics Market**

The covid-19 effect is expected to increase the scale of the Industrial [Robotics](https://www.analyticsinsight.net/know-top-robotics-college-courses-to-take-up-in-india-in-2022/) Market from US$45 billion in 2020 to US$119 billion by 2030. Over the projected period of 2020 to 2030, it is expected to grow at a CAGR of 15%. The 2025 forecast is predicted to be roughly 3% lower than the pre-COVID-19 prediction. The key driving drivers for the business are a lack of qualified labor and government and public-private partnerships presenting suggestions to mitigate the negative consequences of COVID-19.”

<https://www.analyticsinsight.net/the-future-of-industrial-robotics-market/>

Health and Safety