The Impact of Robots and Automation systems on Globalization: A Comprehensive Analysis

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Abstract

In recent years, the use of robots across various industries has grown paramount. Robots and automation technologies have played a significant impact in various aspects including productivity growth, reshoring opportunities, and customisation capabilities for consumers, and have also helped foster international collaboration between nations and businesses. This article does an empirical analysis with the help of case studies to analyse the impact of automation and robots on various industries by discussing their pros and cons. It is also found that although robots have a very positive impact in various spheres of manufacturing, nation development, and helping people, it is that robots are to be implemented with appropriate care to prevent the displacement of people in various economies while also generating jobs for many.

Keywords:

Robots, Automation, Globalization, Productivity, Supply Chain, Labour Market, Reshoring, Nearshoring, Customization , work , employment , society , manufacture , electronic device

Introduction:

In recent years, robots and automation technologies have become integral to various industries worldwide. These advancements are reshaping the landscape of globalization, as they impact everything from the movement of goods and services to labour markets and economic dynamics. This article delves into the profound influence of robots on the process of globalization. As time progresses, for the holistic development of a nation and industries in one, it is important that robots and other automation systems classified as robots, are implemented. The effects of such automating devices and robots are compared under several sub-topics with the help of selected case-studies and brand comparisons.

This study goes in-depth into the effect of robots and automation on and/or leading to:
1) Increased Productivity and Efficiency
2) Supply Chain Optimization
3) Labour Market Changes
4) Enhanced International Collaboration:
5) Reshoring and Nearshoring
6) Enhanced Customization
7) Challenges to Developing Nations

And a parallel is developed to show the impact/ability of robots in said cases.

Increased Productivity and Efficiency:

Robots have revolutionized production processes by significantly enhancing productivity and efficiency. With their ability to work tirelessly and with consistent precision, they have enabled manufacturers to increase output while reducing production costs. This increased efficiency results in competitive pricing for goods and services, making them more accessible to consumers worldwide. Thus, robots have played a pivotal role in expanding global markets by providing affordable products to consumers in various parts of the world. Based on research by Georg Greatz and Guy Michaels from MIT and Uppsala university, it was found that in 17 countries including India from the year 2007 the use of robots helped with an increase in the GDP of a nation by 0.36% when compared to an era when robots did not exist.

It was also found in the research that the use of robots contrary to popular belief DID NOT lower the employment rates and only helped optimize the effort is to output ratio of what a normal manufacturing industry would have.

Robotic automation in the domestic sphere has been found to be time saving for those involved in domestic chores and house help by cutting down the time spent by at least 39% within the next few years. This increased productivity may correspond to job-loss but, the same research concluded that due to the change in portfolios of tasks involved in domestic-help, although help of robots may increase, the unemployment losses shall be subdued. Here by, the robots shall act as efficiency increasing devices that will correspond to the growth of mankind.

<u>Selected Case Study</u>

In this case study, we compare two businesses in Printed Circuit Board Fabrication sector. For clarity and confidentiality, we will refer to them as Business A and Business B throughout this study. Business A represents an Indian fabricator with a turn-around in millions which uses both robotic-mechanised processes and Human resources for fabrication, while Business B embodies a Chinese fabricator who only relies on the use of robotic processes for their fabrication procedures. This approach allows us to analyse and draw conclusions without disclosing specific company identities

Business A utilises on average, a manpower of roughly 100 people for effective assembly of Printed Circuit board. Business B who has integrated robots into their manufacturing ecosystem, use a man-power of only 20 people. Those members who are working on assembly in Business B are not focused on the assembly of the boards themselves. However, they put their efforts in ensuring those robots involved in production continue to assemble PCBs without any interruptions. Business A has shown expenditure towards their PCB assembly unit to be 30 times greater than that of Business B with a greater Error factor*.

From the results above, we can assume that Business B has a better Return On Investment with lesser chance for Human Error which can affect Production Processes. However, it can also be noted that Business A has shown more growth that Business B of around 30% with

Business B being around 12%. This can be attributed to Marketing Techniques and other aspects which are not in the scope of this research.

Supply Chain Optimization:

Automation and robotics have had a substantial impact on supply chain management. The ability to automate warehousing, distribution, and logistics processes has led to a streamlined supply chain. This, in turn, has made it easier for businesses to source materials and deliver products globally. As a result, the world has seen a reduction in lead times, lowered costs, and improved coordination in the global supply chain. This optimizes the flow of goods across borders, facilitating globalization.

Selected case Study:

In this case study, we compare two businesses in the Shipping and Logistics Sector. For clarity and confidentiality, we will refer to them as Business A and Business B throughout this study. Business A represents an Indian Shipping Services provider, while Business B embodies an American Shipping services provider which is a subsidiary of a larger E-Commerce provider who has a worldwide presence. This approach allows us to analyse and draw conclusions without disclosing specific company identities

Business A and Business B are an Indian and American supply chain management and facilitating businesses which operate on a very large scale in both nations.
Business B has deployed over 7,50,000 robots at their warehousing facility in the USA that help sort, fetch and pack orders for customers worldwide. The robots work on the latest Artificially intelligent firmware and help workers by simplifying the delivery process.
Business B claims to have used to have fully worker intensive warehousing facilities which proved to be a great financial burden and also demanded a lot of hours in training for the efficient use of their warehousing facilities. But the robots have removed the probability of "human-error" in an industry where human error can prove to be fatal leading to gross customer loss according to sources at Business B.
Business A has started to set-up warehousing solutions in India which rely on the Use of robots for easier packing and shipping services. Business A has also shown a significant growth in efficiency of said warehouse with last-mile delivering capabilities with the help of Unmanned Aerial vehicles and so has Business B. Business B has reported effective delivery to areas in varied geographical localities including hilly regions while Business A has reported growing demand towards use of UAVs for last-mile delivery requirements including delivery time reduction from over a day to just a few hours.
The data from Both Businesses is consistent with findings from other researchers who have shown the effect of UAVs on Businesses.
Both companies have utilized latest technology to optimize the supply-chain which keeps nations moving hereby leading to a net increase in the Gross-Domestic-Product.

Labour Market Changes:

The integration of robots in the workplace has also influenced labour markets globally. While automation can lead to job displacement in certain industries, it can also create new opportunities in the field of robotics, maintenance, and programming. As more businesses adopt automation technologies, there is a growing demand for skilled workers to develop, operate, and maintain these systems. The evolving labour market dynamics have reshaped the way people engage in the global economy.
Based on research by professor Rudra Tiwari from the IJSREM who has cited more researches in his document, the growth of AI, ML and other industries related to robotics, it was found that low-skilled labour is the most susceptible to growth of robots. According to research by Acemoglu and Restrepo, it was also found that robots have led to an increase in income inequality, but they also refute the same by pointing out an adverse growth in jobs in various other related industries. However, Robots, AI and other emerging technologies have the potential to increase productivity and economic growth by reducing costs.

Enhanced International Collaboration:
The global robotics industry has fostered collaboration between countries. As companies source components and technologies from various nations to build their robotic systems, this encourages international cooperation. Furthermore, the sharing of expertise and technology advances has enabled countries to pool resources and knowledge, leading to a deeper level of globalization. The collective effort to develop and implement robotics technologies is transforming the global economy. Many more companies worldwide use robots for enhanced capabilities and the collaboration shall also lead to the development of all countries involved. As proven by many, for a positive globalization, foreign investments and collaborations are key for the inclusive development of nations involved.
The global robotics industry promotes collaboration between countries, fostering knowledge exchange and resource pooling. This collaboration contributes to inclusive development and economic growth across nations.

<u>Selected case Study:</u>

In this case study, we compare two businesses in the manufacturing sector. For clarity and confidentiality, we will refer to them as Business A and Business B throughout this study. Business A represents a famous Japanese motorbike manufacturer that also develop Pick And Place machines for effective Printed Circuit Board Assembly, while Business B embodies a business manufacturing Mobile Phones in India. This approach allows us to analyse and draw conclusions without disclosing specific company identities

Business A famed for their motorbikes also develop robots for the manufacture of various utilities and hardware. Business A develop the Semiconductor pick and place devices that are used by Business B a phone manufacturer with manufacturing facilities in India, for the assembly of their mobile phones. The robots are designed in the USA and made by a Japanese Company which are operated by a company that manufactures in India which is a proof of the international collaboration.

Similarly, many more companies worldwide use robots for enhanced capabilities and the collaboration shall also lead to the development of all countries involved. As proven by many, for a positive globalization, foreign investments and collaborations are key for the inclusive development of nations involved. These Pick and Place machines developed, according to research have also shown a significant increase in efficiency of Businesses that utilise them over Manual assembly by a great margin.

Reshoring and Nearshoring:

Contrary to the conventional wisdom that automation might lead to offshoring of production, many businesses are now looking to re-shore or nearshore their operations. Robots have enabled companies to bring production closer to their target markets, reducing the need for distant offshore factories. This trend is driven by factors such as rising labour costs in some countries and the desire for more responsive supply chains. By reshoring and nearshoring, companies contribute to the reconfiguration of global trade dynamics. Offshoring often leads to Data-Loss and Brain-Drain which shall have adverse effects on a Nations development and globalization of a nation. This factor is mitigated by Nearshoring and Reshoring service providers and service integrators which will have an adverse growth on the economy. Moreover, the adoption of automation technologies fosters the creation of high-tech manufacturing hubs in previously underserved regions, contributing to regional economic growth and job creation.

<u>Selected Case Study:</u>

In this case study, we compare a business in the mobile phone manufacturing industry in India. For clarity and confidentiality, we will refer to it as Business A throughout this study. Business A represents an Indian mobile phone manufacturing business that operates and was founded in India. This approach allows us to analyse and draw conclusions without disclosing specific company identities.

Business A was a flourishing Indian mobile phone seller that until 2015 sold mobiles made in a foreign nation that were manufactured for cheaper than locally. However, the business decided to shift their operations completely back to India by setting up their own factory. This led the brand to show a significant growth in income because of their reduced costs towards importing and off-shore manufacture in China. Business A retro-fit a local factory with latest robots to stream-line their manufacturing processes. Although Business A reported high investment requirements, the growth in demand for their locally-made products were able to help them re-cooperate their invested amount in a period of time.

The proof of Business A's new-found success and monetary growth is in-line with research performed by others and goes to show that re-shoring with the help of robots has a significant impact on a Nation and businesses implementing them. However, research has

also shown that businesses do not see re-shoring with the help of robots as a profitable business strategy with short-term monetary goals. However, this can be a viable approach for businesses that are willing to invest for long-term growth.

Enhanced Customization:

Automation technologies have also facilitated the production of customized products on a mass scale. This personalization, made possible through robotics, allows companies to tailor their products to diverse global markets. As a result, globalization has evolved to include a more nuanced approach that caters to the specific needs and preferences of different regions and consumer groups.

Alibaba a Chinese company which brought Chinese Manufacturers closer, found out that the robotic technologies sellers used helped divert more sales due to the rise of personalization requests in 'The Age of Personalization'.

According to a survey from the MasterCard and Harvard business review, 80% of professionals say that personalization is a part of their organization's strategy. Personalized products helped businesses divert more attention hereby helping them have a net growth in sales.

Epsilon also found that 80% of consumers worldwide are happy to do business with companies that offer personalization options.

Business for a company also affects a nation. More businesses that flourish, greater is the growth in globalization and a nations GDP. This trend of customisation underscores the growing importance of customization in today's global marketplace.

Challenges to Developing Nations:

While the impact of robots on globalization is generally positive in terms of productivity and efficiency, it does pose challenges to developing nations. As automation technologies continue to advance, some low-skilled jobs may become obsolete. These countries may need to adapt and invest in education and workforce development to remain competitive in a more automated global economy.

Developing nations must prioritize initiatives aimed at enhancing digital literacy and technical skills training to equip their workforce for the demands of the automated economy. Moreover, partnerships between governments, educational institutions, and industry stakeholders are crucial for creating effective training programs and ensuring broad access to opportunities in the digital era. Doing so will have a positive growth on the economy of a nation while also helping with the net progress in terms of Gross Domestic Product (GDP)

Conclusion:

In conclusion, robots have become powerful catalysts of globalization, shaping industries, labour markets, and international relations. They have enhanced productivity, streamlined supply chains, and encouraged collaboration among nations. While the influence of robots

on globalization is multifaceted, one thing is clear: automation is a driving force that is transforming the global economy and the way we engage with it. To harness the full potential of this technology, governments, businesses, and individuals must adapt to the changing landscape and seize the opportunities it offers.

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