Advancements In Robotics: Applications and Implications in Industrial Automation

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Abstract- *Nobody denies the fact that the manufacturing sector is absolutely essential to the overall prosperity of the economy as a whole. It is commonly known that the industrial sector contributes significantly to the economy. These two claims are each valid in their own right. During the course of the past decade, the domestic manufacturing sector suffered losses in about equal amounts of both money and assets. There has been an effect that may be seen directly in the local market share, as well as in the manufacturing capacity and product quality. As a consequence of this, a wide variety of methods have emerged for optimizing the performance of the cutting-edge manufacturing technology available today. These techniques were conceived in an effort to optimize the use of newly discovered technologies. Examples of this sort of technology frequently seen nowadays include robots and several other kinds of automation. The goal of today's manufacturer is to develop a growth plan that will also improve their ability to compete. This is the aspect that is most important to the market. By leveraging a variety of different kinds of electronic communication, we are able to successfully complete our objectives. Due to the significance of information technology (IT) in the public sector, policymakers are compelled to evaluate the significance of the variables that influence the adoption of IT in order to increase the effectiveness of public organizations and the acceptance of technology. This is because IT is important for both employees and management circles in the public sector. It is impossible to exaggerate the significance of information technology (IT) to government employees and supervisors in the United States. The effects that the proliferation of information technology has had on public sector unions and the leaders of such unions in the United States*

Indexed Terms- Applications and Implications, Industrial Automation

I. INTRODUCTION

The manufacturing sector's importance and the enormous contributions it provides to the economy as a whole are beyond dispute. About 10% of the nation's manufacturing capital and resources were lost during the past decade. Local product quality, market share, and production capacity have all suffered as a direct result of this loss. Because of this, several strategies have emerged to help the contemporary industrial setting take advantage of progress in technology. Manufacturing automation and robotics are two such examples of such advances.[1] The modern manufacturing sector aspires to increase productivity and competitiveness in order to pave the way for future economic expansion. If we employ modern forms of communication and information gathering, we can achieve our goal [2,3]. As a collection of cutting-edge technologies that merges information and communication technology with traditional manufacturing methods to produce high-quality results in real time, it is also considered a paradigm shift. Smart manufacturing is emerging as the new standard in the manufacturing industry, which is undergoing the fourth industrial revolution. It is in the best interest of modern businesses to take use of this technology and adapt their practices in light of the constant changes brought about by developments in information technology. There has been an explosion of sophisticated computers, robotics, and software in recent years, and they are all slowly but surely finding their way into a world that was formerly inhabited only by humans. Only humans have ever existed as a species capable of penetrating the realm of the mind. [4] To rephrase, current computers are well-suited to aid in the fight against fraud, as well as in the fields of medicine, law, and auditing, thanks to their superior pattern detection and analytical skills. Similarly, the algorithms that make up AI can swiftly and easily sift through hundreds of papers, provide responses orders of magnitude

faster than any human, and are completely free of the cognitive biases that plague us. There can be no distractions because of the rapid progress toward the outcomes. Because of this, the next technology revolution will likely bring in a slew of substantial advantages for the general people. Innovative products and services will be created, new employment opportunities will open up, productivity will rise, and the unemployment rate will go up as a result.[5,6] Many elements of science fiction books published a decade ago are now a part of our everyday lives. Our modern civilization is characterized by these features. Academics and builders alike are trying to think of novel materials and methods for constructing everything from homes to factories to entire cities, and the result has been a recent increase in the number of innovative concepts. These innovations may end up simplifying and expediting daily tasks. The concept of "smart cities" is also gaining popularity. Although there has been a lot of progress in this field, the concepts are still only a look into the future, and much more effort is needed before they can become a reality.[7]

While the long-term benefits of the novel robotics concept remain unclear, its immediate good influence for the economy cannot be overlooked. [8] As a result, it is crucial to discover such benefits together with the constraints that exist in the robotics sector when it is still in its early stages in order to capitalize on the former and produce and develop new employment towards the objective of general economic growth. Constraints can be studied, and their unfavorable effects mitigated if necessary.[9] To be clear, when we say "robots," we mean a system with sensors, controls, manipulators, a power supply, and predetermined instructions for carrying out a certain mission. In addition, a sensor, an actuator, a microcontroller, and a transceiver are commonplace in the idea of robotics as an autonomous innovation. This holds true in some, but by no means all, situations. It is common to call anything "smart" if it has been upgraded to have more interoperability and better processing capability across several platforms.[10] There is a label for this category of things: "smart." The network of intelligent devices may display this form of intelligence if they examine the system updates and make the decision to carry out the activity. The term "smart network" has come to be synonymous with this type of system.[11]

The International Organization for Standardization (ISO) defines an industrial robot as a "programmed robotic arm that is capable of performing a variety of activities, navigating three-dimensional space, and being controlled independently."[12] It is possible to attribute technological advancement to the proliferation and improvement of industrial robots, which emerged in the 1960s and 1970s. It was in the '60s and '70s when these robots first appeared. Nowadays, industrial robots may be found in almost any industry, with the overarching goal of replacing human labor wherever possible. Concerns have been raised about the possible negative effects of robots on employment rates as a result of the industry's rapid adoption of an investment in robotic technology. As a means of reducing manufacturing costs and improving product quality, using robots to replace human labor in assembly lines has gained widespread favor in the industrialized world. However, a framework might assure the efficient use of robotic systems in the commercial sector, while also helping to prevent adverse outcomes.[13] The Manufacturing Technology (SMT) Survey was conducted in 2016 by the United States Census Bureau in conjunction with the Department of Defense. One of the main goals of this study was to monitor the rate of change as it pertains to the use of new technologies in the American industrial sector. Several businesses were surveyed by the SMT so that we could learn more about their manufacturing processes and the cutting-edge equipment they utilize. Automated material handling, communication and control, automated sensing, design and engineering, automated manufacturing, and automated material handling are all examples of such technologies. The SMT polled businesses to learn more about their infrastructure and how they were putting these technologies to use.[14,15]

Emerging technologies like mobile and the internet, on the one hand, and financial crises and economic developments, on the other, continue to put significant pressure on the global economy, countries and their budget deficits, financial services, and businesses, especially the profitability and revenue sides of the financial tables. There are two sources of these stresses. [16,17]The growth of new technology, such as mobile phones and the internet, is one factor.

However, economic shifts and the impact of financial crises. The current global financial turmoil, with far-reaching implications for the global economy and financial markets, has ushered in a new era for humanity. As a result, the change from one era to the next has occurred far more swiftly than typical. New entrepreneurial endeavors, SMEs, and most importantly, innovation and more research in companies and industries across the developed and 20 countries have been/are exponentially invigorating capital movements and cash flows, especially to developing countries through risk capital funds, business angels, non-bank financial institutions (such as microfinance), mobile operators, and other means. This is particularly the case in industrialized nations.[18]

II. OBJECTIVE OF THE STUDY

1. One, to investigate the practical and theoretical consequences of industrial automation.
2. In order to investigate recent trends in robotics research and industrial automation,

The so-called "Digital Age," brought on by the proliferation of the internet and mobile technologies, has prompted companies to move their operations online and into the cloud, mobilize alongside their customers, and launch their e-government initiatives, while also compelling governments to launch their e-government initiatives and financial institutions to make themselves visible on tablets, smartphones, and social media platforms.[19,20] In other words, the advent of the "Digital Age," characterized by the broad availability of the internet and mobile technologies, necessitated the relocation of businesses' activities online and into the cloud. Electronic signatures and invoices, online and mobile banking, and electronic payments have all contributed to a dramatic rise in efficiency, both in and out of the office. E-business environments ushered in the digital era by standardizing, simplifying, and improving operational operations and business practices.[21] To help with this transition from the industrial to the digital era, e-business ecosystems have been developed. Customer relationship management solutions allow organizations to process and react to vast volumes of data in real time, which is essential since the quantity of data accessible to us rises rapidly every day. In spite of the fact that the information age and other scientific discoveries like mechatronics, nanotechnology, and genetics are all steps toward "Space Economics," other innovations will have a more significant direct or indirect influence on business and economics in the near future. This is quite likely to occur in the not-too-distant future.[22,23] Robots and AI are common metaphors used to illustrate these developments in technology.[24]

According to Kenzie (2015), the "Industrial Age" started with the advent of the Industrial Revolution and the automation of production, both of which he claims were spearheaded by the United Kingdom and the car industry. According to Kenzie, the "Industrial Age" and the "Industrial Revolution" began simultaneously. The first few decades of the twentieth century had a significant effect on both the supply and demand sides of the economy.[25,26]This was particularly glaring in the United States. The technological advancements and increased automation that happened throughout the industrial age influenced everything from land and labor to money and the efforts of firm entrepreneurs. All parts of society, from business and politics to schools and universities, have felt the ripples of these changes (kyr, 1985). The need for highly educated, experienced, and skilled workers has increased in recent years. Management and administrative positions are included. This has increased the need for those with advanced degrees.[27] Workers who want to live close to their places of employment have given rise to housing estates, gigantic buildings, and complexes. This facilitates better collaboration between them. [28]

They decided to make a change in their way of life and relocate to the city instead of staying in the rural area and maintaining the same job routine. From consumer attitudes to cultural norms, money and wages may have an impact, as Davies (1962) demonstrates. Enhanced human productivity has necessitated the development of novel financial and accounting concepts, such as the cost of capital. This has occurred for two main reasons: first, the rights of employees and other issues of bulk population management; and second, the depreciation of allowances for equipment used in production lines and the computation of return on investment of these lines. In the world of banking and economics, the

era of robots and AI is quickly arriving. This will mark a turning point in economic history, with far-reaching consequences for all aspects of human life.[29,30] According to Roubini and Stiglitz (2014), the World Economic Forum 2015 (WEF, 2015) and other publications have highlighted a wide variety of ramifications and repercussions emanating from these difficulties. The recent media coverage is a direct result of these debates and investigations.[31]

This will have far-reaching effects since it will likely lead to an increase in the unemployment rate. Whether or if businesses decide to hire or buy new robots, the great majority of which will have artificial intelligence compared to the first movers, will depend on the first commercial outcome.[32,33]This conceptual and hypothetical work begins by outlining the most important concepts, trends, and actual facts that are still impacting economics, business, and finance today, along with the implications of these aspects. Meaningful concepts, patterns, and numerical values are then discussed. Future disruptive innovations and their effects on industries, management positions, and economic theories are the primary focus of this study, which makes considerable use of an innovative and prospective methodology.[34] The objective is to think forward and talk about how disruptive technologies could change various fields of work, managerial roles, and economic theories. As Jules Verne himself suggested in his books, the future is inextricably linked to the imagination and assessment of its participants.[35]

- Implementation

When combining the data, only the statistics on businesses that were supplied by the BLS and the Census were used. This article takes a look at the ways in which automation and robots are being used to the manufacturing sector in Saudi Arabia, a nation that is experiencing rapid economic growth. There is a correlation between advancements in the design and operation of robots and the possibility of a gain in overall productivity.[32,33] Both of these are highlighted because of the importance they have. The research investigated not just the possibility that robots and automation may boost total production, but also the myriad of possible problems that could arise in a variety of contexts. Investigating whether or if robots and other forms of automation may assist firms of varying sizes

and in a variety of industries become more productive and competitive is something that should be done.[34] According to the findings of this research, there is a significant knowledge gap about robots and automation, particularly regarding their capacity to boost productivity and the infrastructure that has been established for efficient implementation. The study investigated a number of issues that have surfaced during the course of previous investigations into robots. In order to implement robots and automation in the most efficient manner possible, it is absolutely necessary to construct and develop a framework for their best acceptance. This is due to the fact that, in the absence of such a framework, it could be physically difficult to put the technology into use successfully.[36] According to what we've discovered, it looks that having a well-thought-out plan for employing robots and automation is very necessary in order to accomplish the results that one wants from using them. This is an essential need.[37]

- Recent Advances in Artificial Intelligence and Mechanized Work are Changing the Workforce [38,39]

This is broken down into four sections so that it is easier to read. This page's introduction serves as a primer on robotics and automation, so be sure to read those sections first. After that, we will have a look at industrial robots, and finally, we will go through the reasons why robotics and automation are so important for increasing production in the manufacturing industry. The uses of robotics and automation in the context of Saudi Arabia are discussed in the final portion of this article by the article's author. It is essential to get a general understanding of the technology before delving deeper into specific aspects of robotics and automation. The next section will go into great depth on the applicability of this technology in the modern day.[40,41]

- The study of robotics and other forms of automated technology as a

There has been some empirical study carried out in the field of robotics; however, the majority of this research has been on analyzing physical robots owing to the ease with which one can track their movement and state throughout the course of time. In the past, research on the topic of how robots influences the output of manufacturing has given conflicting results. The two researchers, Graetz and Michaels, began their work by

segmenting the information on robot exports provided by the International Federation of Robotics (IFR) according to country, industry, and year.[42] Based on data collected from international sales of robots, it appears that robots are responsible for more than 10% of the productivity boost that industrialized nations saw between and. After gaining a comprehensive understanding of the circumstance in the United States, these findings were compiled.[43,44] The authors contend that this is a significant influence, and that the effect that steam engines had on the productivity of British workers in the 18th century is equivalent to the effect that this factor has. The authors also demonstrated that workers whose levels of competence ranged from moderate to bad often worked fewer hours after getting an increase in salary as a result of the deployment of robots. Using data from patents that have been granted, an investigation of the impact that automation would have on the job market was carried out.[45] The authors conducted a search of all U.S. patents using a method called machine learning in order to locate those that were relevant to automation. Automatic systems that need very little or no involvement from humans are eligible for patent protection. In the end, the authors tracked down likely clusters of patent application activity related to automation inside the United States. They looked at a number of different economic indices and came to the conclusion that while automation results in more jobs being created in the service sector, it results in less jobs being created in the manufacturing sector.[46]

Robotics and several other kinds of factory automation are gaining in significance at an alarming rate. In today's competitive global market, businesses need manufacturing equipment that is not only versatile but also strong in order to keep up with the needs of their customers. [47]The favorable impact that robots and other forms of automation have on the productivity of industrial companies is helping to raise such companies' profiles. Acemoglu and Restrepo did an independent analysis, although it was quite similar to the one that was done previously, on the potential long-term effects that broad adoption of robotic work may have on the labor market in the United States. [48]

We came to the conclusion that the usage of industrial robots in the United States has had a net negative effect on employment and wages during the time period that we looked at by extrapolating the distribution of robots at the industry level using data from other industrialized nations. This allowed us to draw the conclusion that the distribution of robots at the industry level has been extrapolated.[49] According to the authors' calculations, the incorporation of robots into the labor force would lead to the elimination of six jobs and a one percent reduction in annual income for every thousand workers. Workers in blue collar jobs, those without a degree obtained after four years of study, and those employed in the manufacturing sector were the most severely impacted. In addition, they discovered that the extensive integration of robots into manufacturing processes did not result in an increase in job opportunities. In their research titled "Robotics and Employment," the European Commission also looked at the usage of industrial robots throughout Europe. The findings of the European Manufacturing Survey were used as the basis for this investigation on robotics. The poll included contributions from manufacturers in seven different countries throughout Europe. Since that time, this population has been surveyed on a consistent basis, and the results of the most current poll have just been released. The results show that major companies, organizations that specialize in batch production, and facilities that export goods are the most likely to make use of industrial robots.[50] However, an increase in the usage of robots has not been linked to a reduction in the number of people employed. The research that has been done on how automation will affect employment has yielded conflicting findings, suggesting that robots may one day either complement or take the place of human work.[51] According to Frey and Osborne's estimations, over ten percent of jobs in the United States will be at risk of becoming automated within the next twenty years. I share Brynjolfsson and McAfee's concern that artificial intelligence would eventually replace human work rather than merely complement it. On the other hand, a number of authorities have stressed the fact that throughout history, whenever there has been an improvement in technology, the number of prospective work opportunities has also increased.[52]

The Arabian Nights Highlight the Urgent Need for Robotics and Automation in All Industries
If information technology is successfully

deployed inside of an organization, it has the ability to increase organizational and economic performance by lowering costs, increasing productivity, and improving the overall quality of the business's products and services.[53] Because of the favorable benefits that automation tools and robots have had on productivity, efficiency, and employee well-being in recent years, they have become increasingly popular in workplaces.[54] This trend is expected to continue. Some of these benefits include reduced risk and increased assurance of personal protection. According to Rigby, a higher rate of investment in robotics, as recommended by Rigby, may lead to a 10% increase in manufacturing GVA in the UK. In the future, increased dependence on robots and other forms of automation may lead to increases in worker compensation, national competitiveness, product quality, and overall productivity.

The benefits of technological advancement will only accrue to individuals, corporations, and nations if governments and businesses work together actively to prepare the path for it. Because of this, it is very necessary to make investments in the development of robots and training programs for both now employed people and future workers. According to the International Federation of Robotics (IFR), even if the usage of robots is on the rise, the majority of existing applications are still quite specialized, and they are focused in China and a few other growing nations.[55] The Chinese are, as is customary, the most extreme example. The United States of America, China, South Korea, Japan, and Germany were the top five countries to get industrial robots in. In that year, China was the only country to buy a significant number of robots, while India bought only a small percentage. Although robots are currently in use in the automotive sector, industries that rely heavily on human labor, such as the textile trade, have not yet accepted them to a major extent. In spite of the fact that it could look as though worldwide adoption of technology is moving at a speed that is comparable to or even faster than that of the industrial revolution, there are still considerable impediments to its utilization in many nations. In impoverished nations, small companies are often run at a technical disadvantage since there is a lack of readily available funds and a lack of understanding. This places the small enterprises at a disadvantage that

can be difficult to overcome. According to an evaluation conducted by the World Bank, just 2% of Indian SMEs (companies with less than one hundred workers) have been granted patents for international inventions. This figure accounted for businesses that employed one thousand or more people or more.

CONCLUSION

Policymakers must study IT adoption variables to increase government agency productivity and promote innovative technology. IT affects public service and administration at all levels. Concern, perspective, enabling conditions, intent to use, perceived adaptability, enjoyment, sociability, usefulness, social influence, social presence, trust, and behavioral intent to use may influence Saudi industrial firms' acceptance of robotics and automation. Worry, viewpoint, enabling situations, professional objectives, adaptation, enjoyment, sociability, practicality, and one's own practicality are all considered. We examine numerous aspects that may influence Saudi Arabian manufacturers' usage of robotics and automation. This paper states that Saudi Arabia, a developing nation, must solve the variables' core challenges before considering adopting robotics and automation into its creative economy. The paper's author conducted the studies. This perspective informs our study. Thus, this study's main objective is to assess the technology's qualities in this respect. This includes affordability, usability, perceived utility, physical infrastructure, and social acceptance. We examined how firm characteristics influenced public enterprises in low-income countries' robot use using models and existing studies. These enterprises are usually based in low-GDP nations. Upper management, experienced workers, educational opportunities, and basic resources supported the project. The trust models consider the above criteria and a large body of research. Technology gains trust when it makes people's lives simpler, more pleasant, or safer.

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