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Abstract

A corporation or company's production velocity and efficiency are essential. It is necessary to use robotic automation to create a successful organization in a competitive business environment. Recent investments have been made in robots across a wider range of manufacturing sectors. In this era of industry, recent advances in robotics technology are dramatically transforming the business and entrepreneurial landscape. Today, robotics is already well established in many areas of our professional, personal, and even daily lives. This technology can develop and modernize commercial processes, innovative ideas, services, and products and solve complex tasks by producing new results for the massive growth of entrepreneurial activities. This study aims to outline the significance of the impact of investment in robotic automation on business performance and employment at the enterprise level and its further perspectives. Following the review of the most important international articles on exploiting this technology, we conducted a brief study on an Algerian factory to learn about the level of use of robotics technology and its future prospects.

Introduction

Modern technology is developing rapidly, which clearly impacts all fields of life. One of the most critical forms of this phenomenon is the considerable progress made in the field of robotic automation, which is expected to become one of the most in-demand specializations in the labor market in the future. The countries of the developed world are experiencing rapid and surprising progress and a frantic race in this field (Elhamrawy, 2021). Robotic automation is one of the newest technological means of changing human and machine relationships. It has cast a shadow over the patterns of business and entrepreneurship in a big way. Instead, it affects all departments of the organization, whether sales, finance, or human resources. It is also the first step in the journey of institutions and countries toward applying digitization and other emerging technologies (Al Awar, 2018).

The introduction of automation makes repetitive and tedious tasks and activities automatic. They allow workers to be assigned other tasks that require their attention so that these processes can increase the company's organizational efficiency. Through the automation of robots, they can perform specific tasks faster and more reliably than workers, depending on the company's needs, because they do not need periods of downtime and work longer.

The robot has been used in the automotive industry, manufacturing computers and medical prostheses with a sense of touch. There are robots for handling hazardous materials, mine clearance, mail delivery, and fire prevention, with advanced robots becoming increasingly involved in decision-making processes in many areas. Such as manufacturing, health care, banking systems, the justice system, space, service and household fields, and other tasks.

The improved performance of robots is leading them to develop new applications that are no longer limited to manufacturing and production lines, but also apply to areas such as logistics management or surgical interventions. As a result, robots will significantly change the operating mode of companies in the coming years, both from a financial point of view and from a strategic and personnel management perspective.

Today, many robots have come out of their cages and moved around factories and warehouses. Robotics experts expect that, during the next few years, robots will enter all areas of life and human activities, but instead, they will become daily supplies for human society. Which makes our daily lives healthier, safer, and more comfortable, and also plays an increasing role in making our planet sustainable for a rapidly growing global population (IFR, Robots in Daily Life THE POSITIVE IMPACT OF ROBOTS ON WELLBEING, October 2021)

This paper briefly reviews the impact of using automation and robots on business, labor, and entrepreneurship, their advantages, and future developments. This paper is divided into six sections: In section two describes concepts related to robots and their use in different contexts by showing the diffusion and commercialization of robots that have been achieved mainly in recently developed countries. In section three, robotic automation technology is described as the importance of its role in managing and driving an organization. In contrast, the challenges of realizing the benefits and avoiding some of the barriers associated with robotic automation are briefly discussed. Section 4 is devoted to a brief study of the case of a small and medium-sized enterprise (the building materials industry) that has chosen to use robots by analyzing their motivations, the degree of progress in implementation, and the effects of the use of robots on the company's income and prospects. The case study identifies the potential benefits and risks of implementing robotic automation in these companies. Section 5 and 6 summarizes the study's conclusion and provide an overview of the findings, observations, and future prospects.

Robotics and Automation

Managing a high-productivity, the low-cost business has always been a challenge. Companies aim to achieve continuous growth with low costs by automating tedious and repetitive tasks, including the elimination of costly and error-prone manual steps (Al-Slais & Mazen , 2023). Rapidly changing regulatory standards, process complexity, labor-intensive operations, ingestible money, and shorter marketing cycles represent just a few of the critical issues facing most financial institutions (Jha, Prashar, & Nagpal, 2021)

Robotic automation is ideally adapted to meet the needs of process automation, as it offers low-cost solutions, little disruption, short recovery times, and high performance. Companies worldwide widely recognize that robotic automation is the coming digital revolution that will allow employees to skip repetitive activities. It allows

workers to focus on higher value-added projects critical to the company's bottom line (Jha, Prashar, & Nagpal, 2021)

The Robots

Robotics technology has been introduced in many sectors besides manufacturing, such as surgical or rehabilitation robots in hospitals, service robots, autonomous cars and their use in defense, space and the seabed, as well as other robots that have begun to perform difficult tasks, etc.

The Importance of the Robotics Industry

The productivity of robots increases when applied to tasks that they perform more efficiently and at a higher and more consistent level of quality than humans. Robots are essential in carrying out monotonous, time-consuming tasks that many people refrain from or that carrying out them represents a significant danger to their lives. They also avoid humans getting bored from repetitive work or exposure to activities that pollute the environment. During the next few years, robots will enter all areas of life and human activities (Elhamrawy, 2021)

In the field of the industry: The countries of the developed world tend to use robots in industry, which would clearly increase productivity, reduce expenses, overcome the shortage of manpower skills, provide flexibility in industrial work, and improve quality. In the field of medicine: robots are now able to perform surgical operations, as doctors control through cameras; robot arms perform surgeries with high accuracy, deliver medicines and meals to patients, transfer samples for analysis, and treat children with autism disorders, those with developmental disabilities, and others (Muhammad Darar, 2019)

The robots assist the elderly in their daily lives: In homes for the elderly, the robots are used, as the Korean robot can support a person of up to 100 kilos, and the elderly can easily control the chair with a joystick. The robots also help the elderly leave the bed, and they can take the place of friends and relieve loneliness for the elderly. Education: The Early Childhood Education Center in San Diego, California, uses robots as teaching assistants to learn how to vocalize and sing and help children think and start doing things early. In the security field: Robots are successfully used in firefighting, detecting and defusing bombs and explosives, transporting toxic and radioactive materials, and examining storage containers used in the oil, gas, and petrochemical industries, among others (Salama & Abu Qura, 2021)

Robot Installations in 2021

The Corona (Covid-19) epidemic is considered a catalyst for robot technology growth and a digitalization booster. The latest Globe Robotics report (World Robotics Report 2022) indicates the most considerable number of industrial robots ever installed, 517385 in companies worldwide in 2021. This marks a 31% year-on-year increase and exceeds the record for robot installation in 2018 by 22% (see Figure 1). Today, the global stock of operating robots has reached a new high of around 3.5 million units. "The utilization of robots and automation is expanding

at an incredible rate," says Marina Bill, President of the International Federation of Robotics. "In only six years, yearly robot installations more than doubled. According to our most recent statistics, installations increased significantly in 2021 across all key customer industries (Müller, 2022).

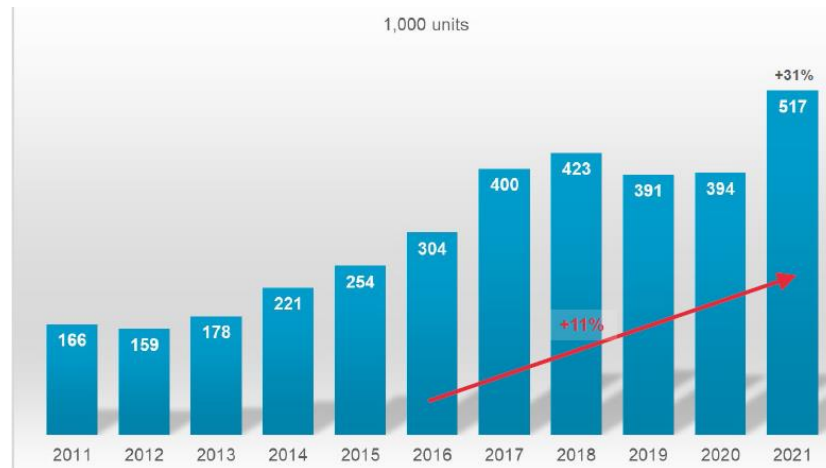


Figure 1. The Annual Installation of Industrial Robots in 2021 [8].

Growth in Major Markets in 2021

The market for robots continues to move as their use has been adopted at unprecedented levels, resulting in huge returns on investment and shorter financial payback periods for giant global institutions. The global market is expected to reach billions of dollars in the next three years. These robots continue to advance and perform complex, high-value-added tasks, significantly impacting organizations' performance and productivity. Reduce costs significantly and develop quality standards.

The top five industrial robot markets are China, Japan, the United States, the Republic of Korea, and Germany. These nations accounted for 78% of all robot installations worldwide (Müller, 2022). Since 2013, China has been the world's largest industrial robot market, accounting for 51% of all installations in 2021, with 268,195 units shipped. This rapid growth reflects the high level of automation in China.

Japan remains the second-largest market for industrial robots after China. In 2021, installations increased by 22% to 47,182 units. Japan is the world's leading manufacturer of robots, with exports of Japanese industrial robots reaching a record high of 186,102 units in 2021. (a country that already had a high level of automation in industrial production). With 34,987 units installed, the United States accounted for 14% of all robot installations. The United States has surpassed the Republic of Korea to take third place. The Republic of Korea ranked fourth after the United States, Japan, and China. In 2021, robot installations climbed by +2% to 31,083 units.

Germany, Europe's biggest market and the only European country to feature in the world's top 5, increased the number of installations by 6% to 23,777 units. In 2021, worldwide service robotics sales grew by 37%. Transportation of products or freight, hospitality, medical robots, professional cleaning, and agriculture are the

top five uses for professional service robots.

The Advancement of Robotic Automation

The advancement of robotic automation has resulted in recent significant developments in robotics. From a business standpoint, global rivalry for robotics automation research and robot production is increasing tremendously (Dahiya & Psannis, 2021). Advanced technologies such as artificial intelligence, blockchain, robotics, and IoT (Internet of Things) are rapidly powering the existing markets. It can be challenging for industry researchers and experts to keep pace. Knowledge, ideas, creativity, and technological developments are critical components of entrepreneurship and economic progress (Xu, David, & Kim, 2018) (Nawaz, 2019). Nowadays, most firms aim to use robotics technology to create massive innovation generating new entrepreneurial potential and stimulating social and economic progress in creating a higher standard of living (Nawaz, 2019).

Robotic automation frees humans from tedious and monotonous tasks that free them up for higher-value jobs requiring human creativity, intelligence, and decision-making. Also, it helps ensure that outputs have more quality, improve speed, reduce human error, and increase throughput, to deliver higher value for the customers, which allows for increasing the amount of material or items passing through a system or process (Han Ping, Criteria, Use Cases and Effects of Information Technology Process Automation (ITPA), 2014) (Romão, João, & Carlos, 2019). Not only does automation enable reshoring, but companies that deploy robots are also less likely to relocate or offshore in the first place, according to a report prepared for the European Commission by the Fraunhofer Institute for Systems and Innovation Research (Jha, Prashar, & Nagpal, 2021) (Dahiya & Psannis, 2021) (Analysis of the impact of robotic systems on employment in the European Union, 2015).

The study and Analysis of robotics and its applications for entrepreneurship is a highly significant subject that may help researchers provide future research paths and dimensions. Looking ahead, the McKinsey Global Institute predicts that up to half of the total productivity growth needed to ensure a 2.8% growth in GDP over the next 50 years will be driven by automation (McKinsey Global Institute, 2017). A report by Accenture, in collaboration with Frontier Economics, forecasts the potential of automation to double Gross Value Added (GVA) across 12 developed economies by 2035, with labor productivity improvements of up to 40% (Accenture, 2016).

The Advantages of Robotic Automation

The benefits of robotic automation are considerable and extensive. The following is a non-exhaustive list of the benefits of robotic automation (IFR, October 2021) (IFR, 2017).

Productivity Improvement

The nature of the products implies that several parts of the production cycle are repetitive and require less high-level human skills. Using robots for automating these operations can improve productivity, as the availability of robots can reach 70% (for collaborative robots) and 99% (for industrial robots). Better availability leads to less

downtime, which means that robots do not need to "rest" for long periods during their life cycle. As robots perform monotonous tasks, the assembly line's human workforce can focus on other creative and meaningful tasks such as planning, supervision, and control. Thus, human knowledge capabilities can be integrated with the high availability of robots to achieve maximum productivity. The increased use of robots also allows societies in higher-cost regions to "off-shore" or bring back to their country elements of the supply chain that they had previously outsourced to cheaper sources of labor. Today, the major challenge posed to employment is not automation but the inability to remain competitive.

Higher Flexibility

Once the products change in nature from time to time, the assembly line must have sufficient capacity to handle the frequency of such changes. Traditionally, this has been classified as a challenge rather than an advantage due to the difficulty of programming a robot to perform a new task. Technically, it was possible to wait weeks or even months and then spend large sums of money on hiring an expert in robot programming for each change, like the product. Now, this is no longer necessary. With no-code robotics tools such as Wandelbots Teaching, anyone, especially shop floor workers, can teach their own robots new skills. Therefore, no matter how often a new process is required, the assembly line workforce (robots and humans) will always be ready to meet the task.

Decreased Cycle Times

By eliminating processes that do not significantly change the product or by replacing ineffective tools with more efficient ones, the time required to complete a production process from beginning to end can be reduced. Production managers generally want to keep cycle times as low as possible. Since cycle time is the sum of production and waiting time (between two sub-production processes), the automation of robotics can significantly contribute to reducing it. Since robots can work around the clock at high speed and the processes are already running, the production time has already been reduced to a minimum level.

However, implementing an easy-to-use robot learning solution such as Wandelbots provides an additional benefit to the waiting time. If factory floor employees can teach the robots new skills in minutes, this optimizes the waiting time and reduces the overall cycle time. For production managers not already operating with robots on their lines, the automation will reduce the production time and the waiting time (if your robots work with Wandelbots).

Enhanced Quality and Precision

To reduce cycle times manually, a compromise between speed and quality is often necessary. Thus, errors can occur when humans are tasked with performing repetitive activities at high speed for a long period. This means that quality levels cannot be guaranteed in this way. On the other hand, robotic automation is an ideal solution, as it increases speed without affecting the product's quality or the process's precision. Robotics increases the quality and accuracy of many processes, as the robots are consistent in their actions.

Robots Complement and Augment the Human Workforce

Collaboration between robots and humans will be the future. While robots replace work activities, not jobs, less than 10% of jobs are fully automated. Robots will increasingly complement and augment work activities, and the net impact is positive on jobs and the quality of work. With automation, humans can focus on higher quality, better-paid jobs. The challenge is enabling lower- and middle-income employees to develop further or retrain. And governments, as well as companies, must focus on providing current and future workers with the right skills to ensure that the positive effects of robots on employment, job quality, and wages continue.

The experts cited in this paper argued this point, which IFR supports. Governments need to invest in robotics research and development to achieve the employment benefits of this growing sector. It must also provide political incentives and education systems capable of supporting the acquisition of the skills needed to secure and thrive in the jobs created or changed by the deployment of robots and automation. In addition, companies must actively engage in appropriate retraining programs for employees to equip them with the right skills. To achieve these goals, the collaboration between the public and private sectors will need to be intensified and coordinated.

Assist in Improving Health Outcomes

They enhance occupational health by performing heavy lifting and other non-ergonomic tasks in the manufacturing, logistics, retail, and healthcare sectors. They're raising the production efficiency of drugs and medical devices, cleaning and disinfecting hospitals, allowing nurses to focus on patient care by fetching and transporting laundry and medicines, keeping the elderly living independently longer, enabling patients to recover faster and better from conditions such as stroke, and increasing mobility for people with physical disabilities.

Reduce Environmental Impact

By optimizing the production process and reducing carbon emissions in specific processes. Robots enable manufacturers in developed economies to produce closer to the customer at competitive prices, which minimizes energy consumption in the supply chain. Robots reduce waste and material rejection. They are increasingly equipped with energy-saving features, from lightweight materials to drive technologies.

Improve Food Quality and Sustainability

Using robots in agriculture will reduce the use of pesticides and energy while helping to save water. Robots assist us in obtaining fresher food and sustaining small farms. It is clear that the robotic automation system helps the production manager do his or her job in many ways. It affects the main objectives, like optimal productivity and flexibility, minimum cycle times, and high quality. Furthermore, since robots can quickly perform several monotonous tasks, more humans become available to perform challenging and creative tasks. Automation is excellent, but it has to be automated correctly, with the right solutions, to get the best possible benefits.

Literature Review

Several studies seem to agree that robotic process automation can have very positive effects, as shown in Table1:

Table 1. Summary of Various Literature Reviews of Robotic Process Automation

Ref.	Studies	Reduction of processing times	Improving productivity	Improving levels of compliance	Limits	Future trends
(Gomathi, 2022)	Automating The Task Of Transferring Data From Spreadsheet To Database Using Robotic Process Automation	✓		✓		
(Hussain, Remya, Nazia, & Rifat , 2022)	Machine Learning Methods Of Industrial Automation System In Manufacturing And Control Sector Using Joystick With And Robotic Technology	✓	✓	✓		
(Axmann & Harmoko , 2020)	Robotic Process Automation: An Overview And Comparison To Other Technology In Industry 4.0	✓	✓	✓	✓	
(Chakrabort, et al., September 13–18, 2020)	From Robotic Process Automation To Intelligent Process Automation	✓	✓	✓		✓
(Sutipitakwong & Pornsuree , 2020)	The Effectiveness Of RPA In Fine-Tuning Tedious Tasks	✓	✓	✓		
(Yatskiv, Solomiya, & Anatoliy, 2020)	Method Of Robotic Process Automation In Software Testing Using Artificial Intelligence	✓	✓	✓	✓	✓

Ref.	Studies	Reduction of processing times	Improving productivity	Improving levels of compliance	Limits	Future trends
(Radke, Andreas, & Albert, 2020)	Using Robotic Process Automation (RPA) To Enhance Item Master Data Maintenance Process	✓	✓	✓		✓
(Gupta, Sangeeta, & Amit, 2019)	Recent Trends In Automation-A Study Of RPA Development Tools					✓
(Van Chuong, Phan Duy, & Vu Thu, 2019)	Robotic Process Automation And Opportunities For Vietnamese Market	✓	✓	✓		
(Osman, 2019)	Robotic Process Automation: Lessons Learned From Case Studies					✓
(Maalla, 2019)	Development Prospect And Application Feasibility Analysis Of Robotic Process Automation					✓
(Moffitt, Andrea, & Miklos, 2018)	Robotic Process Automation For Auditing	✓	✓	✓		✓
(Kedziora & HANNA, 2018)	Digital Business Value Creation With Robotic Process Automation (RPA) In Northern And Central Europe	✓	✓	✓		
(Ratia, Jussi , & Nina, 2018)	Robotic Process Automation - Creating Value By Digitalizing Work In The Private Healthcare?	✓		✓		
(Willcocks, Mary, &	Robotic Process Automation: Strategic	✓	✓			

Ref.	Studies	Reduction of processing times	Improving productivity	Improving levels of compliance	Limits	Future trends
Andrew, 2017)	Transformation Lever For Global Business Services					
(Lacity & Leslie, 2016)	A New Approach To Automating Services Criteria, Use Cases And	✓	✓	✓	✓	
(Han Ping , 2014)	Effects Of Information Technology Process Automation (ITPA)	✓	✓	✓	✓	✓
(Bloem , et al., 2014)	The Fourth Industrial Revolution - Things To Tighten The Link Between IT And OT	✓	✓	✓		
(Friedman, 2006)	Gartner Study On Data Quality Shows That IT Still Bears The Burden			✓		

Case Study

As the International Federation of Robotics indicates, the use of robots in small and medium-sized organizations (SMEs) is expanding rapidly (IFR). In 2019, SMEs accounted for 44% of the total number of robots installed globally, representing a significant increase from 2015, when SMEs accounted for only 27% of the total number of industrial robots installed. Many factors have influenced the use of robotics in SMEs, especially the need to raise productivity, reduce costs, and improve competitiveness. According to a survey by the IFR, 84% of SMEs that have adopted robots reported an increase in productivity, while 76% reported a reduction in production costs. Furthermore, 64% of SMEs reported improved product quality due to using robots (IFR, 2020)

According to research by the European Commission, the deployment of robots has also had a positive effect on employment creation in SMEs. The study concluded that using robotics in SMEs has created new jobs in areas such as robot programming, installation, and maintenance. The use of robots has also enabled companies to retain jobs that would have been lost due to outsourcing.

The government of Algeria has emphasized the need to modernize and improve the manufacturing sector, including deploying new technology, such as robotics, to boost productivity, competitiveness, and economic growth. In 2018, it established the National Industrial Development and Investment Plan (PNIDI), which aims to modernize the country's industrial sector and enhance its competitiveness. The plan includes initiatives to promote

the use of advanced technologies such as automation and robotics in manufacturing, including providing incentives and support for SMEs to adopt these technologies.

To conduct our comparative study, we focused on small and medium-sized enterprises (SMEs) operating in the building materials industry in southern Algeria. We selected a sample of SMEs that rely on robots in their industry and compared them with their counterparts from enterprises that do not depend on robots. Our study focused on key performance indicators, such as productivity levels, efficiency, job satisfaction, and financial performance. By comparing these two approaches, we aimed to provide insights into the benefits and drawbacks of using robots versus human labor in the building materials industry in southern Algeria.

To Summarize This Study

- Companies that depend on robots are considerably more productive than those that rely on human labor. Organizations that use robots have been just as effective as those that do not. This suggests that robots could make the building materials industry much more productive and efficient.

- The organizations that employ robots use fewer workers than their human counterparts, which suggests that robots have the potential to reduce the number of workers needed to achieve a certain level of production in the industry. However, this does not necessarily mean that robots will lead to widespread job losses in the sector. Instead, it highlights the need for organizations to consider the impact of automation on their workforce and develop strategies for worker development and reskilling to remain relevant in a changing industrial landscape.

- Organizations that use robots generally offer their employees different kinds of incentives than their human labor counterparts. Specifically, they provide training programs for their staff to learn how to use and maintain the robotic systems and financial incentives such as bonuses or higher pay to employees who can successfully integrate the robotic systems into their work.

- Organizations that base their operations on robots have higher performance and product quality levels than their human labor counterparts. These systems can operate 24 hours a day, seven days a week, without human fatigue or error. In addition, they can often perform tasks that are difficult or impossible for humans, leading to product design and manufacturing innovations. These findings suggest that organizations using robots in the building materials industry may have a competitive advantage in terms of performance and efficiency.

- Organizations that rely on robots tend to have lower labor costs than their counterparts. While the initial investment in robotics systems may be higher, the long-term savings from reduced labor costs and increased productivity can be significant. Additionally, organizations that rely on robots may be able to produce higher-quality products and have a competitive advantage in the marketplace, which can lead to increased revenue and profits.

Overall, our study suggests that using robots in the building materials industry in southern Algeria can improve

productivity, efficiency, and product quality while reducing labor costs. However, it's vital for organizations to consider the impact of automation on their workforce and to develop strategies for upskilling and reskilling workers to remain relevant in a changing industry landscape. In the following table, we detailedly compared companies that use robots and their counterparts that rely on the human element.

Table 2. Comparison between Factories that Depend on Robots and Those that Depend on Humans

Characteristic	Factories relying on robots	Factories relying on humans
Labor costs	Lower	Higher
Work accidents	Lower	Higher
Flexibility	High	Moderate
Consistency and accuracy	High	Moderate
Speed	High	Moderate
Maintenance	High	Low
Job loss	This can lead to job loss	No direct job loss
Capital costs	High	Low

Note: The terms "high," "moderate," and "low" are relative and depend on the specific context and factory operations.

Conclusion

This paper analyzes the importance and developments of the application of “robotic automation” to companies, the workforce, and entrepreneurship. Previous international studies have shown that automation and robotics technologies have become part of the sustainable development strategies of some business institutions, as they save effort and time in exchange for increasing efficiency in performing some human activities, thus improving the position of institutions in the competitive environment. Robotic technologies have enabled the automation of many activities, such as finance, human resources, manufacturing, etc. Finally, the results related to the reality of the use of robots in some building materials manufacturing institutions in Algeria were presented. The results confirmed that these institutions deal with technology as a global development priority. According to the sample members, it was found that there was a desire among decision makers and the availability of the technological structure, which encouraged the adoption of robotic automation and constructive innovations in building physical institutions. It seems that the current status of indicators indicates an imminent positive change in business institutions in Algeria with the implementation of Ministerial Resolution N° 1275, which includes a start-up institution certificate/patent to pursue innovation and university business incubators, as it represents a practical solution to revive the role of the university as a driver of the economic wheel for industrial, productive and service institutions.

References


Dahiya, A., & Psannis, K. (2021, September). *Role of Robotics Engineering in Entrepreneurship*. Retrieved from

- Insights2Techinfo: <https://insights2techinfo.com/role-of-robotics-engineering-in-entrepreneurship/>
- Muhammad Darar, K. (2019). Ethics of Artificial Intelligence and Robotics. *International Journal of Library and Information Sciences*, 11, 247.
- Accenture. (2016). *Why Artificial Intelligence Is the Future of Growth*. Accenture.
- Al Awar, A. (2018). How RPA will impact the future workplace Fine particles, thin films and exchange anisotropy Federal Authority for Government Human Resources United Arab Emirates. *HRecho*(8).
- Al-Slais, Y., & Mazen , A. (2023). Robotic Process Automation and Intelligent Automation Security Challenges: A Review. *International Conference On Cyber Management And Engineering* (pp. 71-77). IEEE.
- (2015). *Analysis of the impact of robotic systems on employment in the European Union*. Luxembourg: Publications Office of the European Union.
- Axmann, B., & Harmoko , H. (2020). Robotic process automation: An overview and comparison to other technology in industry 4.0. *the 10th International Conference on Advanced Computer Information Technologies (ACIT)* (pp. 559-562). IEEE.
- Bloem , j., van Doron, M., DIVERSTING, S., EScoffier, D., Rene, M., & Van Ommeren, E. (2014). *The Fourth Industrial Revolution - Things to Tighten the Link Between IT and OT*.
- Chakrabort, T., Vatche, I., Rania, K., Yasaman, K., Vinod , M., Yara, R., & Merve, U. (September 13–18, 2020). From Robotic Process Automation to Intelligent Process Automation: –Emerging Trends. *In Business Process Management: Blockchain and Robotic Process Automation Forum: BPM 2020 Blockchain and RPA Forum* (pp. 215-228). Seville, Spain: Springer International Publishin.
- Elhamrawy, H. (2021). The basis of civil responsibility for robots between the traditional rules and the modern trend. *Journal of the Faculty of Sharia and Law in Tafuna Al-Ashraf - Dakahlia*, 23(8), 3059-3102.
- Friedman, T. (2006). *Gartner study on data quality shows that IT still bears the burden*. Stamford: Gartner Group.
- Gomathi, R. (2022). Automating the Task of Transferring Data from Spreadsheet to Database using Robotic Process Automation. *International Conference on Augmented Intelligence and Sustainable Systems* (pp. 1257-1260). IEEE.
- Gupta, S., Sangeeta, R., & Amit, D. (2019). Recent trends in automation-a study of rpa development tools. *the 3rd International Conference on Recent Developments in Control, Automation & Power Engineering* (pp. 159-163). IEEE.
- Han Ping , F. (2014). Criteria, Use Cases and Effects of Information Technology Process Automation (ITPA). *Advances in Robotics & Automation*, 3(3), 124.
- Han Ping , F. (2014). Criteria, Use Cases and Effects of Information Technology Process Automation (ITPA). *Advances in Robotics & Automation*(3).
- Hussain, S., Remya, P., Nazia, A., & Rifat , J. (2022). Machine Learning Methods of Industrial Automation System in Manufacturing and Control Sector using Joystick with and Robotic Technology. *the 11th International Conference on System Modeling & Advancement in Research Trends* (pp. 1134-1140). IEEE.
- IFR. (2017). *The Impact of Robots on Productivity, Employment and Jobs*. the International Federation of Robotics.
- IFR. (2020). *VDMA Robotics Frankfurt Main*. Germany World Robotics: International Federation of Robotics.
- IFR. (October 2021). *Robots in Daily Life THE POSITIVE IMPACT OF ROBOTS ON WELLBEING*. Frankfurt:

- International Federation of Robotics.
- Jha, N., Prashar, D., & Nagpal, A. (2021). Combining Artificial Intelligence with Robotic Process Automation- An Intelligent Automation Approach. *Studies in Computational Intelligence*, 945, 245-264.
- Kedziora, D., & HANNA, K. (2018). Digital Business Value Creation with Robotic Process Automation (RPA) in Northern and Central Europe. *Management*, 13(2).
- Lacity, M., & Leslie, W. (2016). A new approach to automating services. *MIT Sloan Management Review*, 58(1), 41-49.
- Maalla, A. (2019). Development prospect and application feasibility analysis of robotic process automation. *IEEE 4th Advanced Information Technology, Electronic and Automation Control Conference* (pp. 2714-2717). IEEE.
- McKinsey Global Institute. (2017). *"A Future That Works: Automation, Employment and Productivity"*. mckinsey & company.
- Moffitt, C., Andrea, M., & Miklos, V. (2018). Robotic process automation for auditing. *Journal of emerging technologies in accounting*, 15(1), 1-10.
- Müller, C. (2022). *Industrial Robots, IFR Statistical Department, VDMA Services GmbH*. Germany,: International Federation of Robotics VDMA Robotics.
- Nawaz, N. (2019). Entrepreneurship in the age of artificial intelligence and robotics. *International Journal of Human Resource Management and Research*, 9, 28-33.
- Osman, c. (2019). Robotic Process Automation: Lessons Learned from Case Studies. *Informatica Economica*, 23(4).
- Radke, A., Andreas, M., & Albert, T. (2020). Using robotic process automation (RPA) to enhance item master data maintenance process. *LogForum*, 16(1).
- Ratia, M., Jussi , M., & Nina, H. (2018). Robotic process automation-creating value by digitalizing work in the private healthcare?. *the 22nd International Academic Mindtrek Conference*, (pp. 222-227).
- Romão, M., João , C., & Carlos, J. (2019). Robotic Process Automation: A case study in the Banking Industry. *14th Iberian Conference on Information Systems and Technologies (CISTI)*. Coimbra, Portugal.
- Salama, S., & Abu Qura, K. (2021). Challenges and Ethics of the Age of Robots. *Emirates Center for Strategic Studies and Research*, 196.
- Sutipitakwong, S., & Pornsuree , J. (2020). The effectiveness of RPA in fine-tuning tedious tasks. *the 6th International Conference on Engineering, Applied Sciences and Technology*, (pp. 1-4).
- Van Chuong, L., Phan Duy, H., & Vu Thu, D. (2019). Robotic process automation and opportunities for Vietnamese market. *the 7th International Conference on Computer and Communications Management*, (pp. 86-90).
- Willcocks, L., Mary, L., & Andrew, C. (2017). Robotic process automation: strategic transformation lever for global business services. *Journal of Information Technology Teaching Cases*, 7(1), 17-28.
- Xu, M., David, J., & Kim, H. (2018). The Fourth Industrial Revolution: Opportunities and Challenges. *International Journal of Financial Research*, 9(2), 90.
- Yatskiv, N., Solomiya, Y., & Anatoliy, V. (2020). Method of robotic process automation in software testing using artificial intelligence. *the 10th International Conference on Advanced Computer Information Technologies* (pp. 501-504). IEEE.

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