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Industry 4.0 and Artificial Intelligence and its contribution to Modern Companies: A systematic study

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Abstract

The incursion of new technologies has brought enormous benefits to society in general, and in particular to organizations, giving rise to the concept of Modern Company. In this sense, Industry 4.0 arose by introducing technologies such as Artificial Intelligence, the Internet of Things, Big Data, cloud computing and robotics to organizations, which made it possible to modernize their operation, providing them with competitive advantages, increasing productivity. and innovating products and services. The objective of this research is to identify the contribution made by Industry 4.0 and Artificial Intelligence, to what is known today as a modern company. This research is descriptive with a quantitative approach of non-experimental design. A systematic review of the literature was carried out in Scopus and Google Scholar using the Publish or Perish application, and under the PRISMA model. The synthesis of the study was made by analyzing each of the 10 most cited articles. The need to establish an ethical framework in the use of Artificial Intelligence is evident, with guidelines towards the autonomy, dignity and responsibility of creators. It can be affirmed that companies are likely to be impacted positively or negatively by technology. Some are beginning to see these technologies as a threat, in relation to the displacement of labor due to the automation of factories and the social transformations resulting from Industry 4.0.

Keywords: process automation, fourth industrial revolution, systematic study, industry 4.0, artificial intelligence, modern companies.

1. Introduction

The incursion of new technologies has brought enormous benefits to society in general, and in particular to organizations that found themselves in need of transforming their traditional models into ones that would adjust to the requirements of a globalized and constantly changing world, giving origin of the concept of modern companies, which have the ability to develop digital copies of the real world and self-manage in real time (Cortés et al., 2017).

In this sense, the fourth industrial revolution or also Industry 4.0 (I4.0) is an event that emerged in Germany in 2011, when technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), the Big Data (BD), Cloud Computing (CC) and robotics to organizations, which allowed them to modernize their operation, giving them competitive advantages, increasing productivity by innovating in products and services (Basco et al., 2018).

AI can be defined as the ability of machines (generally computers and other devices provided with software) to learn from data and use it to make decisions, among other activities, equating human beings through the use of algorithms, with the advantage that machines escape their biological limitations, and are provided with the ability to surpass their abilities, make fewer errors, and process a greater amount of data (Rouhiainen, 2018). With the advancement of new programming techniques, concepts such as Machine Learning (ML) have enabled machines with AI to learn, that is, to incorporate new knowledge without the need for human intervention in order to optimize their operation (Rozo, 2022; Biamonte et al., 2017; Brunton, Noack & Koumoutsakos, 2020).

The IoT is the digital space where various technologies are combined that have provided objects to connect to the Internet autonomously and generally easily, and through sensor networks capture environmental data such as temperature and humidity, or vital signs of heart rate, blood oxygen level or blood pressure, and exchange data between devices and with people who now have the possibility of having a large amount of relevant information (Novillo et al., 2018). It is estimated that by 2020 there were approximately 40 billion IoT devices connected to the Internet, and that by 2025 the figure will increase to 120 billion, generating around 180 billion gigabytes of data that are stored through CC for be analyzed with technologies such as BD and AI, in order to obtain valuable knowledge that benefits all sectors of society (Lasso, 2021).

While CC allows different people and organizations to store their information or digital assets within a server located on the Internet (Palos, Reyes & Saura, 2019), evolving the way in which data is managed, bringing different advantages to society in general, since it is flexible and offers greater storage capacity compared to traditional hard drives (Langmead & Nellore, 2018; Sunyaev, 2020), BD refers to large sets of information, which can be structured data, not structured and semi-structured, focusing on characteristics such as volume, speed, variety, veracity and value thereof (Lasso, 2019), these aspects being fundamental because they allow organizations to be more proactive since data analysis improves planning , prediction and decision making (Oussous et al., 2018).

Due to the above, for example, it is estimated that the data digitization market with IoT and BG applications will grow by 6% in Latin America between the years 2019-2025 in sectors such as health, smart agriculture, E-Commerce and management. public (Lasso, Franco & Estrada, 2022).

The objective of this research is to identify the contribution made by two of the most important technologies today, such as I4.0 and AI, to what is known today as a modern company. To achieve the above, a systematic review of the literature will be carried out, taking as reference Scopus considered the most used bibliographic database for systematic and bibliometric analysis (Bangso et al., 2023), and Google Scholar (GS) a source of easy access that applying restrictions does not reduce the veracity of the information (Halevi, Gkypali, Roper, 2017; Martín, Thelwall & Orduna, 2021), in addition to the fact that in both sources much of the content consulted is available online in full text for all users, as stated in the Open Access 2020 initiative, which enacts unrestricted access to scientific material published in specialized journals (Araiza, Ramírez & Díaz, 2019).

Some metrics are also presented, such as: number of articles cited in both data sources, average citations per article, average number of authors per article, and Hirsch's h-index, among others. In addition, one-dimensional bibliometric indicators of the number of articles published in the observation window, co-citation of authors and keywords were analyzed. This makes it possible to

identify and quantify the status of scientific publications, as well as to select material according to its contribution and research quality (Espinosa et al, 2019).

2. Methodology

This research is descriptive with a quantitative approach of non-experimental design, which aims to address the influence of I4.0 and AI in modern companies, through a systematic review based on the PRISMA (Preferred Reporting Items) model. for Systematic Reviews and Meta-Analyses) that presents a guide to researchers in relation to conceptual and methodological issues to carry out this type of study (Urrútia & Bonfill, 2010). From the model in particular, the checklist (Table 1) was used to determine the items in the query and the inclusion and exclusion criteria of the articles found, as well as to establish the synthesis of the results (Zavaleta et al., 2023). As previously mentioned, Scopus and GS were used as a query source through the Publish or Perish (PoP) 8.8 application, a strategy that was also used in the investigations by Al Husaeni & Nandiyanto (2021), Hudha et al., (2020) and Setyaningsih, Indarti & Jie (2018). As a visualization strategy of map co-citation and co-occurrence of words to VOSviewer 1.6.18.

Table 1. PRISMA items taken into account for the research

Section	Description
Title	Title of the research article
Abstract	It allows determining the relationship between the concept of I4.0 and AI in organizations, as well as the type of study and the most relevant conclusion
Objectives	Objective of the article adjusted with the research
Eligibility Guidelines	Only open access articles available in scientific journals will be considered. Likewise, the query keywords must appear in its content, and have been published between 2018 and 2022. All articles are written in English. It is not excluded by type of investigation. Duplicate articles resulting from the query in Scopus and GS are eliminated
Information sources	Scopus and GS will be used through the PoP application, in which the search was carried out using the equation: "industry 4.0" AND "artificial intelligence" AND (organizations OR companies)
Selection of studies	For the analysis of articles by year, co-citation and co-occurrence of key terms, the total number of articles resulting after applying the eligibility guidelines will be taken into account
Summary of results	The synthesis of the study will be carried out by means of an analysis of each of the 10 most cited articles resulting after applying the eligibility guidelines
Effect Description	The study is expected to serve as academic reference material in areas of knowledge related to research
Limitations and Conclusions	Make visible the academic production of researchers around the world, as well as provide a general notion from the theoretical and practical point of view about the concepts studied and their relationship with current organizations

Source: Own elaboration (2023).

3. Results of the bibliometric study

3.1 Citation metrics

As a result of the query executed in PoP, a total of 192 documents were obtained in Scopus and 998 in GS, to which the eligibility guidelines were subsequently applied, finally resulting in a total of 939 papers, 133 (14%) from Scopus and 806 from (86%) of GS with whom the bibliometric analysis was carried out.

From the results of the metrics, it is highlighted that despite the fact that the articles selected from Scopus only represent 14% of the sample, they present an average of 46.11 citations per article, higher than the 26.29 of the citations in GS, which means that the Higher quality research productivity is more concentrated in journals indexed in Scopus.

Table 2 shows the Scopus and GS citation metrics reported by PoP.

Table 2. Citation metrics

Item	**Result**	
	Scopus	**Google Scholar**
Publication years	2018-2022	
Citation years	5 (2018-2023)	
Papers	133	806
Citations	6132	21192
Citations/year	1226.40 (acc1=133, acc2=128, acc5=95, acc10=66, acc20=33)	4238.40 (acc1=473, acc2=364, acc5=230, acc10=152, acc20=83)
Citations/paper	46.11	26.29
Authors/paper	1.00/1.0/1 (mean/median/mode)	2.66/3.0/2 (mean/median/mode)
Hirsch h-index	39 (a=4.03, m=7.80, 4657 cites=75.9% coverage)	66 (a=4.87, m=13.20, 15157 cites=71.5% coverage)
Egghe g-index	75 (g/h=1.92, 5626 cites=91.7% coverage)	134 (g/h=2.03, 17959 cites=84.7% coverage)
Papers with ACC (annual citation count) >= 1, 2, 5, 10, 20	133, 128, 95, 66, 33	473, 364, 230, 152, 83

Source: Own elaboration based on PoP (2023).

3.2 Number of articles per year

According to the analysis of the results of the consultation, it is observed that the year with the highest number of publications in both data sources was 2021 with 280, and the year with the lowest was 2018 with 74 in total, also presenting a growth figure between these years, which shows an increase in academic interest in both technologies and their impact on organizations as mentioned in the research by Castellanos and

Escott (2020), Corvalan (2019) and Fajardo (2019).

Table 3 shows the number of articles published per year in Scopus and GS.

Table 3. Number of articles published per year

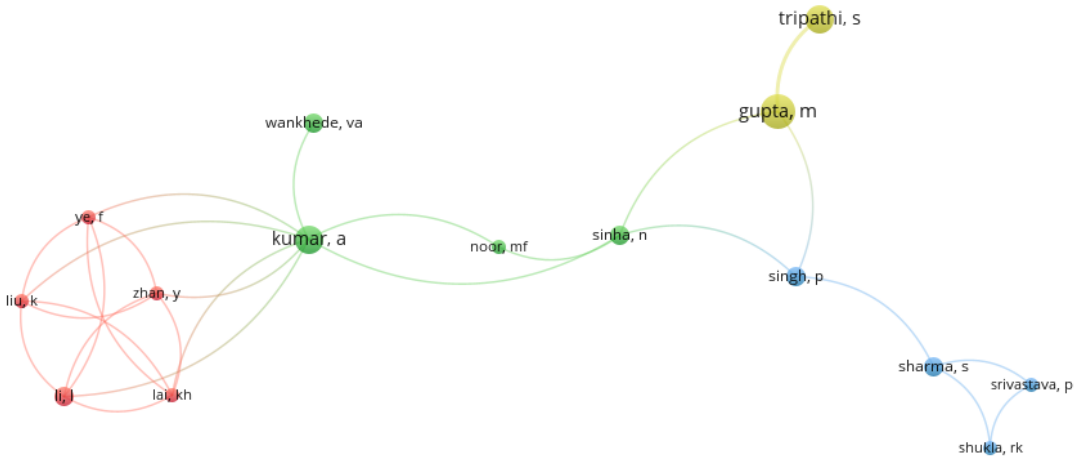
	Number of articles		
Year	**Scopus**	**Google Scholar**	**Total**
2018	14	60	74
2019	18	130	148
2020	34	165	199
2021	39	241	280
2022	28	210	238

Source: Own elaboration based on PoP (2023).

3.3 Co-citation map

Figure 1 shows the co-citation map according to the data sources used. The authors with the highest co-citation were Gupta, M. with 6 and Tripathi, S. with 5, being located in cluster 4 (yellow). Based on the results, it is presumed that there is no leading author(s) in the field, and that, on the contrary, there is a wide variety of researchers interested in the subject, which may be an indication of its importance for society.

Figure 1. Co-citation map



Source: Own elaboration based on VOSviewer (2023).

3.4 Word co-occurrence map

Figure 2 shows the word co-occurrence map that was made with 65 items categorized by VOSviewer in 5 clusters. Table 4 shows the

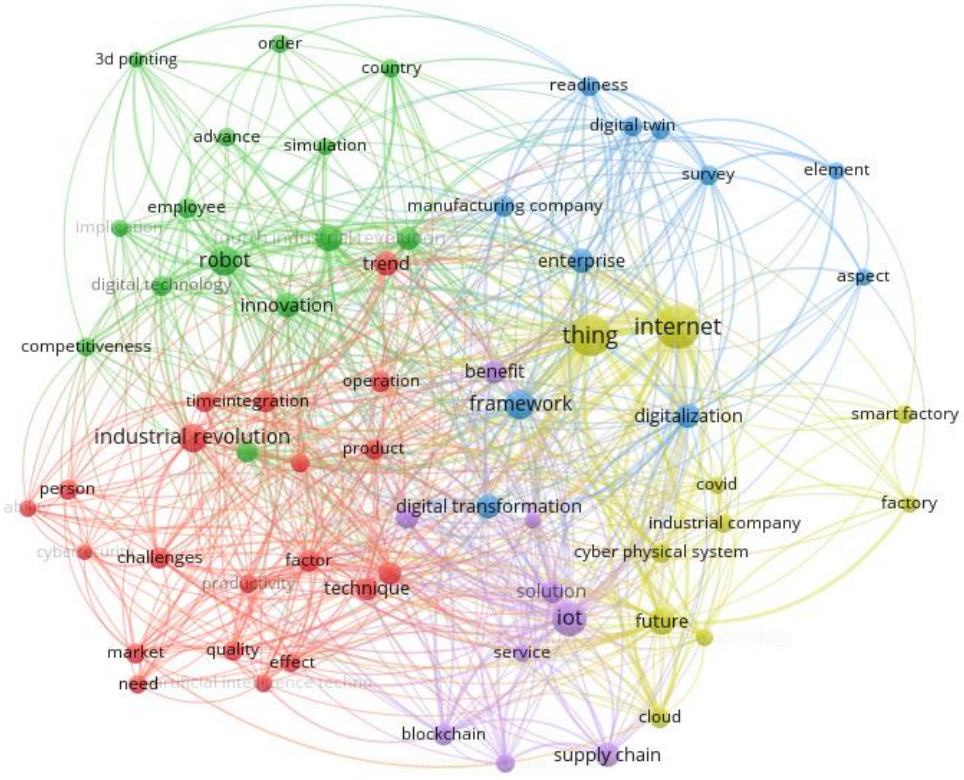
characteristics of the map. It can be seen that the item with the most occurrences was "internet", followed by "industrial revolution" and "iot", proving that these concepts are very similar to the management of modern companies (Flórez, Aguilera & Salcedo, 2019).

Table 4. Number of articles published per year

Cluster	Color	Number of items	Most frequent item	Number of occurrences
1	red	18	industrial revolution	38
2	green	17	robot	26
3	blue	12	framework	36
4	yellow	11	internet	81
5	violet	7	iot	38

Source: Own elaboration based on VOSviewer (2023).

Figure 2. Word co-occurrence map



Source: Own elaboration based on VOSviewer (2023).

3.4 Synthesis of results

The synthesis of the research results was carried out based on the analysis of the 10 most cited articles obtained in the consultation in Scopus and GS, a procedure comparable to that used in the investigations of Quindemil et al., (2023), Toribio et al., (2023) and Jaime, Chávez & Castillejos (2023).

This type of analysis is taken as a measure of recognition of the research and the impact of the authors within the area of knowledge, in addition to helping other authors to give relevance to their research by including renowned and quality scientific documents (Corrales & Dorta, 2018; Connelly et al., 2020; He et al., 2020).

Table 5 shows its most relevant data.

Table 5. Top 10 most cited articles

	Citations	Title	Authors	Publication year	Journal	Article type
1	896	The fourth industrial revolution: Opportunities and challenges	Xu, M., David, J. & Kim, S.	2018	International Journal of Financial Research	Revision
2	894	Scanning the industry 4.0: A literature review on technologies for manufacturing systems	Alcácer, V. & Cruz-Machado, V.	2019	Engineering Science and Technology, an International Journal	Revision
3	592	The Role and Impact of Industry 4.0 and the Internet of Things on the Business Strategy of the Value Chain-The Case of Hungary	Nagy et al.	2018	Sustainability	Case study
4	493	Industry 4.0: Are we ready?	Ślusarczyk, B.	2018	Polish Journal of Management Studies	Investigation
5	185	The fourth industrial revolution (Industry 4.0): technologies disruption on operations and supply chain management	Koh, L., Orzes, G. & Jia, F.	2019	International Journal of Operations & Production Management	Revision
6	171	Dealing with the game-changing technologies of Agriculture 4.0: How do we manage diversity and	Klerkx, L. & Rose, D.	2020	Global Food Security	Revision

		responsibility in food system transition pathways?				
7	153	Drivers and Barriers in Using Industry 4.0: A Perspective of SMEs in Romania. Processes	Türkeș et al.	2019	Processes	Case study
8	145	Impact of COVID-19 outbreak on employee performance – Moderating role of industry 4.0 base technologies	Narayanam urthy, G. & Tortorella, G.	2021	International Journal of Production Economics	Case study
9	134	Artificial Intelligence and Machine Learning Applications in Smart Production: Progress, Trends, and Directions	Cioffi et al.	2020	Sustainability	Revision
10	97	Tackling Faults in the Industry 4.0 Era - A Survey of Machine-Learning Solutions and Key Aspects	Angelopoul os et al.	2020	Sensors	Revision

Source: Own elaboration (2023).

Below is a summary of each article.

1. The fourth industrial revolution: Opportunities and challenges (Xu, David & Kim, 2018)

Focused on presenting a historical review of the industrial revolution in its four periods. Emphasis is placed on the opportunities present in the fourth revolution (I4.0), and it is argued that the traditional way of managing organizations does not apply to the new economy, where it is necessary to encourage employees to enhance their capabilities, greater inclusion of AI in management processes, integration of robotics in production, use of 3D printing technologies that reduce the gap between inventors and the market, and the implementation of IoT, expanding the connectivity of machines with systems and services, making them more autonomous the production process and the supply chain.

A series of challenges concerning I4.0 and its related technologies are exposed, such as: 1) generation of greater inequality in the labor market; 2) the displacement of labor by automation as a result of the massive use of machines; 3) issues related to Cybersecurity (CS), since employees and machines will be connected to the Internet, and sensitive data may be exposed on the network.

It is concluded that I4.0 is benefiting the communication between the industry and the consumer, since the latter will be more involved in the production and distribution chains, which improves their expectations in relation to the quality of the product.

2. Scanning the industry 4.0: A literature review on technologies for manufacturing systems (Alcácer & Cruz-Machado, 2019)

Review article about various current and future technologies used in production systems that lead to the Smart Factory. The concept of I4.0 is addressed, and the Industry 4.0 Reference Architecture Model (RAMI4.0) is described, which is a guide for the implementation of I4.0 technologies. This is based on the IEC 62.890 and IEC 62264 standards. The first focused on the management of the product life cycle, and the second focused on the integration of business control systems.

In this regard, the IoT leads to a digital era in organizations that use AI algorithms and technologies such as BD, IoT, CS, and Intelligent Robotics, through industrial environments that now use CC to have real-time data available from machines giving rise to the concepts of Cloud Manufacturing and Industrial Internet of Things (IIoT), which with the help of BD and AI-based Cyber-Physical Systems allow greater control and reliability in production and maintenance processes, increase efficiency, reduce costs, improve the business model, planning, logistics management, products, customer services and the decision-making process.

Finally, reference is made to the fact that new simulation modeling paradigms such as the Digital Twin (digital twin) provide a high-fidelity simulation of I4.0 processes, as well as augmented reality techniques, Additive Manufacturing (commonly known as 3D printing) and the use of autonomous robots programmed with AI that interact with each other, open up new possibilities for manufacturing components that are difficult to build with traditional techniques, which is a competitive advantage in the market.

3. The Role and Impact of Industry 4.0 and the Internet of Things on the Business Strategy of the Value Chain-The Case of Hungary (Nagy et al., 2018)

Research that aims through a mixed methodology to reveal how a sector of 43 industries in Hungary analyze the phenomenon of I4.0 and the problems associated with its implementation, as well as the use of IoT characteristics to manage their processes. The article highlights that the implementation of I4.0 mainly requires three factors: 1) the horizontal integration of the value chain; 2) a networked production system, and 3) the complete digitization of the business value chain. The foregoing is supported by new technologies such as IoT, wireless sensor networks, BD, CC, integrated systems and mobile Internet, implemented on secure platforms, which can result in a decrease in costs in the value chain of about 3.6% per year, a decrease in delivery times, greater efficiency in the use of raw materials and better quality of the final product.

The authors conclude that there are companies that have decided to postpone the decision to implement I4.0 due to the lack of training and high costs associated with the purchase of new technologies, but that recognize that they can achieve a significant reduction in expenses and an increase in income. They also highlight the importance of the data captured through the IoT, and how these can be shared with suppliers and customers, and used for the development of new products.

4. Industry 4.0: Are we ready? (Ślusarczyk, 2018)

Article that, through the analysis of secondary data obtained from institutional and governmental reports, shows the attitude of a sector of businessmen in particular from the United States, Germany and Japan, in relation to the ability to implement I4.0, and identify factors make it difficult. It is determined that I4.0 is basically associated with three phenomena: 1) the digitization of information and the guarantee that there is constant communication between people, people and machines, and between machines; 2) the more recurrent implementation of new technologies in all sectors of society that allow a progressive growth of the socioeconomic system; and 3) the development of autonomous machines that execute AI.

In this sense, technologies such as IA, IoT, cyber-physical systems, industrial automation, CS and industrial DB, manage to affect the manufacture of a product which will have a digital identification that will allow the capture of data from its life cycle until it arrives. at the hands of consumers. Consequently, the production and marketing departments will identify consumption trends in real time and thus establish plans that are

adapted to the needs of the market, as well as improving communication throughout the supply chain and logistics lines.

It is concluded that there is a growing willingness on the part of entrepreneurs to implement I4.0 tools in their organizations since they identify the improvements that it brings with it in production and competitiveness, so its implementation is necessary, and that this depends on the country and its environment, and it can even become an individual decision. They also recognize that there are economic obstacles that can delay its adoption, the same conclusion reached by Nagy et al. (2018).

5. The fourth industrial revolution (Industry 4.0): technologies disruption on operations and supply chain management (Koh, Orzes & Jia, 2019)

Literature review where, similar to Alcácer and Cruz-Machado (2019), it is mentioned that technologies such as IoT, AI, Big Data, CC, CS and robotics are the heart of I4.0, and highlight the role that play in the integration of the entire business system. In this scenario, the implementation of the IoT will be further boosted due to the increase in the financing of government plans such as: Manufacturing in the United States, Industrie du Futur in France, Industry 4.0 in Germany, Industry 4.0 in Italy, Made in China 2025 and UK smarter. In addition, they consider six principles when implementing I4.0 in organizations: 1) interoperability; 2) virtualization; 3) decentralization; 4) real-time capability; 5) service orientation and 6) modularity.

It is highlighted that I4.0 can promote sustainable development, achieving a reduction in raw materials, which results in a lean and more profitable production, in addition to reducing the problem of industrial waste disposal, facilitating environmental and social sustainability.

Similarly to Ślusarczyk (2018), they mention that the different industrial sectors apply I4.0 adoption models according to the environment and budget allocated to the purchase of new technologies.

6. Dealing with the game-changing technologies of Agriculture 4.0: How do we manage diversity and responsibility in food system transition pathways? (Klerkx & Rose, 2020)

Literature review to give an approach to the concept of Agriculture 4.0 (A4.0) and its close relationship with I4.0. In this sense, the A4.0 makes use of existing platforms and technologies such as IoT, AI, robotics, blockchain, sensors, nanotechnology and cellular agriculture, among others, to minimize the impact on ecosystems, improve harvest processes and production of a wide variety of crops, and avoiding food waste. Therefore, A4.0 has the capacity to transform the way in which agricultural production systems are implemented, impacting the economy and society in general, by promoting food and nutritional security, goals established in the Sustainable Development Goals of the United Nations.

However, they show that the adoption of A4.0 can be a factor in the increase in nutritional inequality, since these technologies can be concentrated in the hands of a few with sufficient economic power, fostering a dangerous monopoly that affects the sectors with fewer resources and developing countries.

7. Drivers and Barriers in Using Industry 4.0: A Perspective of SMEs in Romania (Türkeș et al., 2019)

Research to identify the perception of 176 SME managers in Romania about the adoption and difficulties to implement I4.0. The study emphasizes that SMEs play a fundamental role in the development of the circular economy, and in this sense they understand the need to implement new technologies such as I4.0 that improve the supply chain and production processes, that guarantee them space in a globalized environment. Likewise, they recognize that they require more preparation to face the challenges that this entails.

According to the analysis of results, it was found that for SMEs the fundamental technologies to be implemented in order of importance are: robotics, systems integration, BD, IoT and CS. Also, that the organizations studied are not yet trained for I4.0. On the other hand, like Ślusarczyk (2018), the authors conclude that there is a growing interest in the implementation of I4.0, but that there is an economic lack that prevents its

adoption in the short term, confirming what was stated by Nagy et al. (2018).

8. Impact of COVID-19 outbreak on employee performance – Moderating role of industry 4.0 base technologies (Narayanamurthy & Tortorella, 2021)

Case study where the impact on performance due to COVID-19 was identified in 106 employees from different economic sectors, and how I4.0 and its associated technologies such as BD, IoT, CC and ML mitigated work needs and communication. In this framework, the research mentions that in those organizations that present higher rates of digital implementation and automation thanks to the incorporation of technologies such as I4.0, productivity rates were maintained despite mobility restrictions and social distancing, therefore The incursion of new technologies such as virtual and augmented reality, 3D scanning and printing, and biosensors are expected to become increasingly present in medical settings.

The researchers found that for workers doing their work remotely positively influences their performance. In addition, there is confusion in the organizations analyzed in relation to the fact that they do not clearly understand the advantages of implementing I4.0.

9. Artificial Intelligence and Machine Learning Applications in Smart Production: Progress, Trends, and Directions (Cioffi et al., 2020)

Article about the application of AI and machine learning in industry as elements of I4.0. It is evident that the adoption of new technologies is very important to accommodate concepts such as the smart and sustainable factory. Among the most important advantages of using AI in manufacturing processes are: 1) increased innovation; 2) optimization of processes and resources, and; 3) improvement in the quality of the products.

According to the results, it can be concluded that the United States, China and part of Europe are the countries that show the greatest interest in the research field. Figures similar to those of Koh, Orzes & Jia (2019) are presented in relation to the investment destined for the implementation of I4.0, where the United States and China, who have declared their interest to be a world leader by 2030, carry out increased efforts to achieve dominance of the AI sector.

In relation to sustainability, it is expected that the implementation of I4.0 will generate a more intelligent use of raw materials and reduce energy consumption and polluting emissions into the environment.

10. Tackling Faults in the Industry 4.0 Era-A Survey of Machine-Learning Solutions and Key Aspects (Angelopoulos et al., 2020)

Literature review focused on characterizing the processes of detection, prediction and prevention of failures in I4.0 and presenting solutions based on AI and ML. Like the study by Alcácer & Cruz-Machado (2019), the study evidences the contribution of IoT, CC, BD and CS to I4.0, by offering tools that bring dynamism to organizations, allowing them to exercise greater precise control thanks to the capture of data in real time with sensor networks that are sent to centralized systems to be analyzed with AI algorithms that optimize production methods.

In this sense, the evolution in areas such as AI and ML have opened up new possibilities for automating tasks, exercising greater computer security by preventing cyber attacks, and improving industrial maintenance processes in real time, since they help to predict and prevent failure of defective components by reducing machine downtime, which translates to busier assembly lines.

On the other hand, I4.0 does not contemplate production lines without workers, on the contrary, spaces will be developed that will require qualified personnel capable of interacting with robots that will carry out routine, complex and dangerous tasks for humans.

4. Conclusions

On the influence of I4.0 and AI in modern companies, the study shows that there are different points of view. For example, López (2019) argues that what he calls the "socio-labour issue" must be taken into account, which translates into the

impact that AI has on workers. They perceive AI and technological changes as a threat to their job stability, especially in jobs that are considered monotonous and repetitive. However, authors such as Cuervo (2021), Brenes et al. (2020) and Beraud (2018), argue that AI, more than a threat, can be considered as a support for the work carried out by workers; both in the most repetitive ones, such as agriculture, as well as those that are considered creative and socially more active, since according to the authors, in this type of work, a successful conversation focuses on consumers, and AI allows the creation of marketing campaigns. more efficient marketing to capture these consumers.

It is also important to take into account the ethical aspect of the use of AI in organizations and in society in general. Serrano (2021) exposes the need to establish an ethical framework in the use of AI, with guidelines towards the autonomy, dignity and responsibility of creators.

After reviewing the literature on I4.0 and AI, and establishing the relationship of both concepts with modern companies, it can be stated that these are likely to be positively or negatively impacted by technology. I4.0 and AI are two phenomena that have a very large field of action thanks to the ability they have to change activities in organizations. As a result of this, some are beginning to see them as a threat, especially in relation to the displacement of labor due to the automation of factories and the social transformations resulting from I4.0 (Granados, 2022).

This raises questions such as: How far will these phenomena go? Do the benefits outweigh the harms? How much will the organizations that are known today change? What will be the role of humans in the new world of AI and the possible next industrial revolutions? All these questions serve as input to continue with research related to the field of technology and its impact on modern companies and in all sectors of society.

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