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Review Article

Literature Review on the Use of Emerging Technologies for Industrial Process Automation: Analysis of Developments from 2020 to 2024

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Abstract - *The manuscript aims to analyze how advances in emerging technologies can improve efficiency in industrial process automation through a systematized collection of manuscripts between 2020 and 2024. The PRISMA methodology was used for the review, initially collecting 2509 manuscripts, leaving 73 important manuscripts published and indexed in EBSCO Host (38), ProQuest (24), ScienceDirect (4), and Scopus (7). The scientific evidence shows that emerging technologies allow solving problems in business processes through automation, identifying operational inefficiency and unproductivity: consumption of resources, time, money, effort, and materials (47%) and human errors (18%). Likewise, the sectors that benefit most from the implementation of automation technologies are "Manufacturing industry, industrial processes" (17%) and "Services and customer relationship management" (11%). In addition, among the new automation technologies, according to the studies, Artificial Intelligence (28%) stands out as the most used due to its effectiveness in various fields, followed by robotics (18%). The results of this manuscript demonstrate implications in the practical context, contributing to the body of knowledge on the use of emerging technologies such as AI, IoT and RPA in the efficiency and transformation of business processes. These findings broaden the understanding of how these technologies replace repetitive tasks and enable process redesign under new strategic and adaptive approaches. These findings show that producing scientific articles on emerging technologies in industrial process automation has experienced significant growth, demonstrating the enormous scientific effort made in recent years.*

Keywords - *Automation, Enterprise, Artificial Intelligence, Business, Technologies, Cloud computing, Computer vision.*

1. Introduction

Adopting technologies such as computer vision, natural language processing and expert systems is intended to facilitate management decisions, problem-solving and understanding of human communication [1]. Technologies can help startups improve visibility and compete with larger companies [2]. Therefore, achieving the highest productivity is important in today's business environment, leading organizations to invest in improvements. The constant search is essential to guarantee quality and sustainability, especially in times of crisis and technological advances [3]. The current market demands that companies rethink their strategies and put on the table the implementation of new processes to maximize their productivity and improve their processes [4]. For this reason, automation refers to systems that help to transfer tasks and production tasks, mainly performed by human operators, to the set of available technological components [5]. Automation in process management, integration of information systems and adoption of emerging technologies, such as AI and cloud computing, are integrated to improve the performance and efficiency of processes in companies [6]. This technological advancement has promoted innovation and development of automated systems in various sectors, thus generating many competitive advantages such as cost reduction and increased productivity. This highlights how important automation is in managing educational, political and social processes [5]. In the digital era, artificial intelligence in companies is crucial, as it helps to improve competitiveness and resilience in the face of disruptive events, such as the confinement of 2020, by strengthening the production and adaptive capacity of the companies themselves, allowing them to anticipate future challenges. This multidisciplinary field, which combines computer science and linguistics, aims to create computer systems capable of performing tasks previously done by people [7]. Some case studies show evidence that even staff resist change [8]. Emerging technologies, especially AI, have significantly changed the global business landscape by automating accounting processes [9]. Since 2016, AI has revolutionized company customer management, improving customer experience, sales acquisition and retention. This change, according to studies, analyzes its impact on the business-

customer relationship and personalization through chatbots and virtual assistants, gaining strength in recent years with additional components such as RPA + AI, IoT-Based Platform and Deep Learning, deep learning and neural network [10, 53, 85, 89].

In addition, the intelligent robotic process automation (RPA) system stands out, which learns from existing applications to communicate with other expert systems [11]. On the other hand, Artificial Intelligence (AI) is fundamental in the business world and greatly impacts various industries. Although it cannot perform common sense activities like people, its processing and analysis capacity stands out, processing large volumes of information and improving response times, which makes it an indispensable tool. Through its specialized software, AI can analyze data and provide suggestions to users, which gives value to the results and accelerates the decision-making process in business [12]. With this scenario, this systematic review aims to analyze business automation technologies, focusing on their practical application, benefits, limitations, and future trends, to give a comprehensive view of companies' effective implementation of these tools in their processes.

2. Methodology

2.1. Type of Study

This report is characterized by the systematized search, compilation and classification of studies related to a specific topic [13].

2.2. Review Questions

The following questions arise:

RQ1: In which database do you find more studies on the automation of industrial processes using emerging technologies?

RQ2: In which countries have the most studies been published on the automation of industrial processes through emerging technologies?

RQ3: In which year were the most studies published on industrial process automation using emerging technologies?

RQ4: What problems do emerging technologies solve in industrial process automation?

RQ5: What are the sectors that benefit from the implementation of emerging technologies in industrial process automation?

RQ6: What are the trends used in companies for the optimization of industrial processes with the processes with the help of emerging technologies?

RQ7: What impact have emerging technologies had on the automation of industrial processes?

2.3. Manuscript Research Strategy

2,509 scientific articles were collected from databases such as EBSCO Host, ProQuest, ScienceDirect and Scopus, and 73 relevant articles were selected. The search used keywords such as automation, enterprise, artificial intelligence, business, technologies, cloud computing, and computer vision.

2.4. Criteria for Selecting or Discarding Information

The criteria used for the compilation of studies are detailed below; see Figure 1.

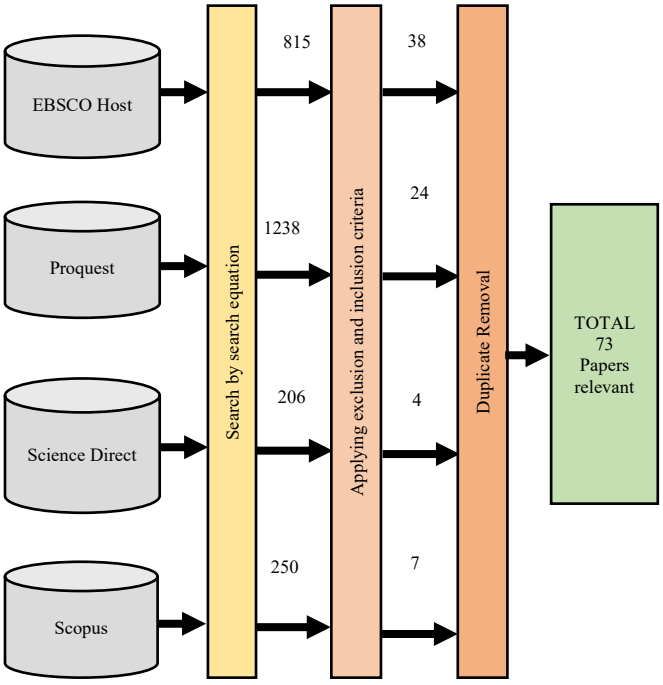

Fig. 1 Study inclusion chart.

Table 1. Criteria for selecting or discarding information

Selection	
I01	Manuscripts that respond to the research questions
I02	Articles published between 2020 and 2024
I03	Articles related to industrial process automation and technology
I04	Articles from reliable sources
Exclusion	
E01	Articles unrelated to emerging technologies in companies
E02	Articles not published between the years 2020 and 2024
E03	Articles unrelated to industrial process automation and technology
E04	Articles from unreliable sources

3. Results

Then, through the PRISMA diagram [13], Figure 2 shows in a transparent and detailed way the filtration of manuscripts, leaving 73 relevant studies.

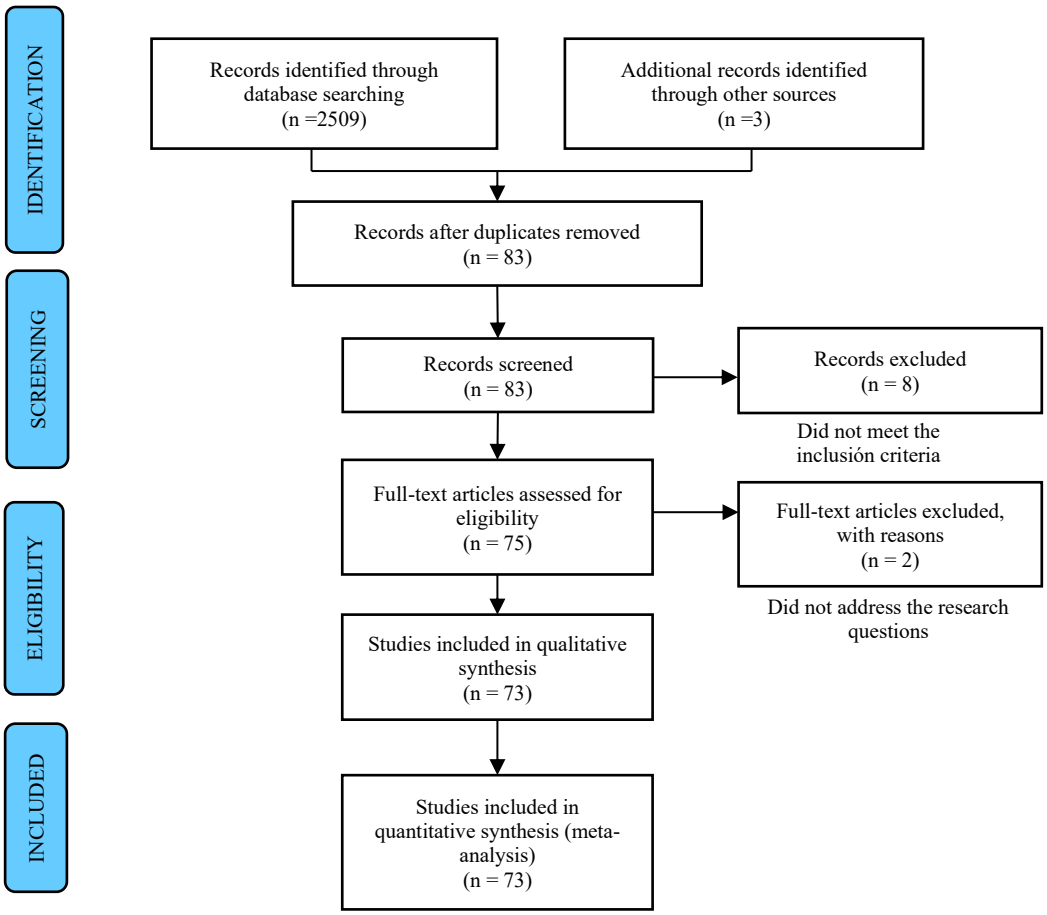

Fig. 2 Prisma methodology diagram

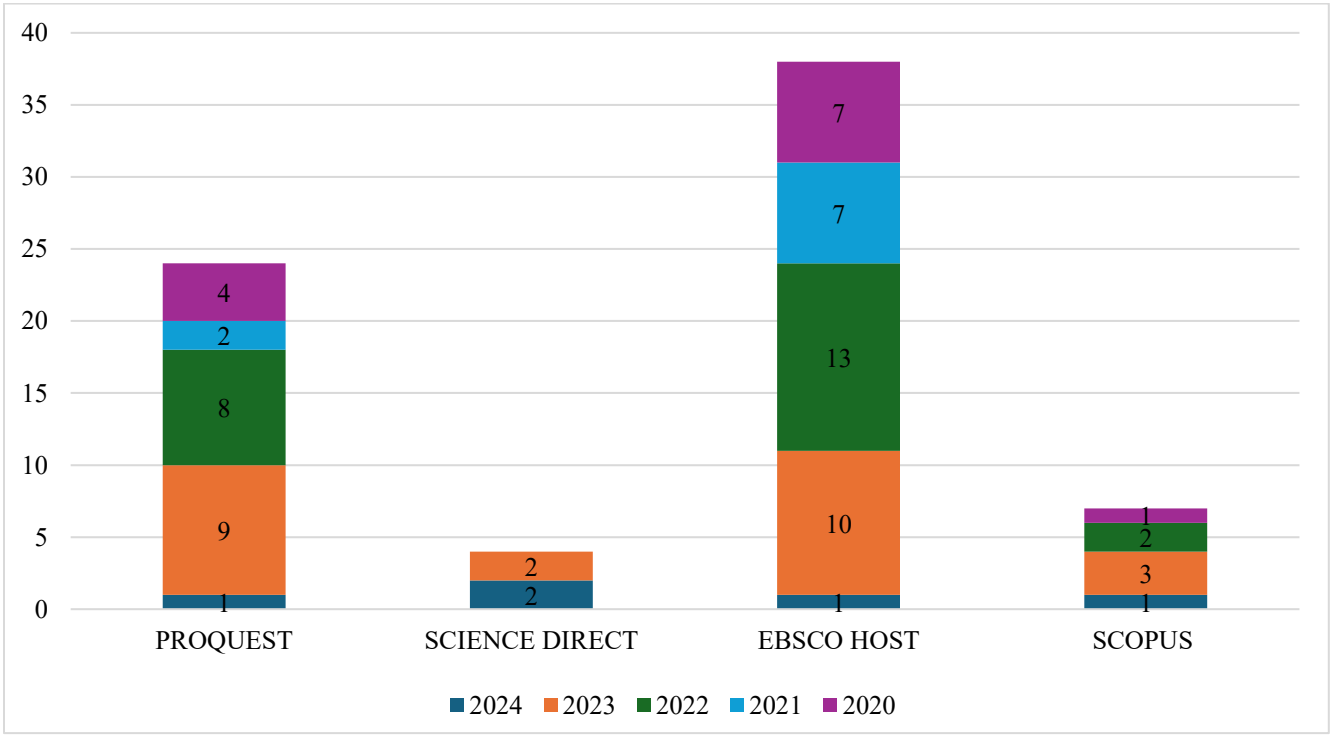

Fig. 3 Articles by database and year

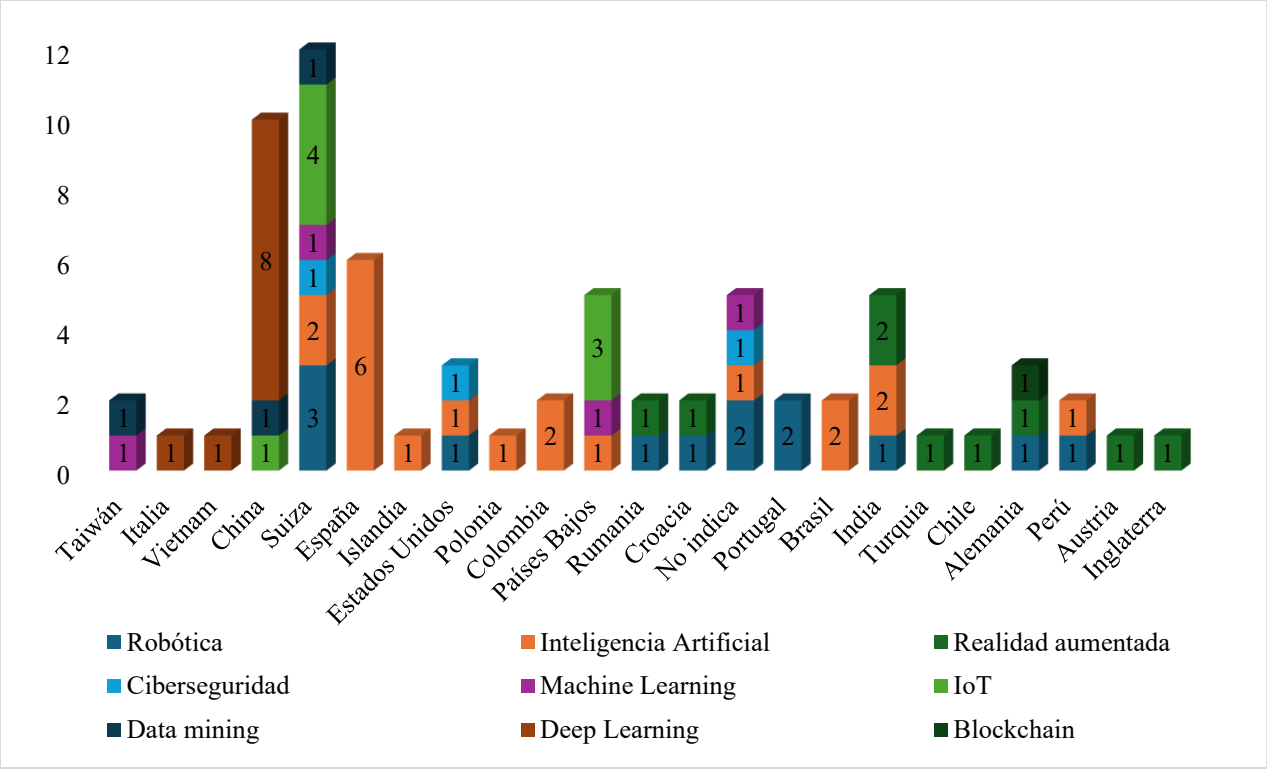

Fig. 4 Distribution of manuscripts by technology and location

Bibliometrics is a discipline responsible for calculating scientific communication and performing a quantitative study of the production, dissemination, and utilization of information (books, journals, websites or conferences) in all intellectual fields but with attention to scientific information [14]. VOSviewer is a tool designed to generate and analyze maps constructed from network data, primarily focusing on analysing academic publications. However, it can also be used for any network data [15]. The data network map is shown below; see Figure 5.

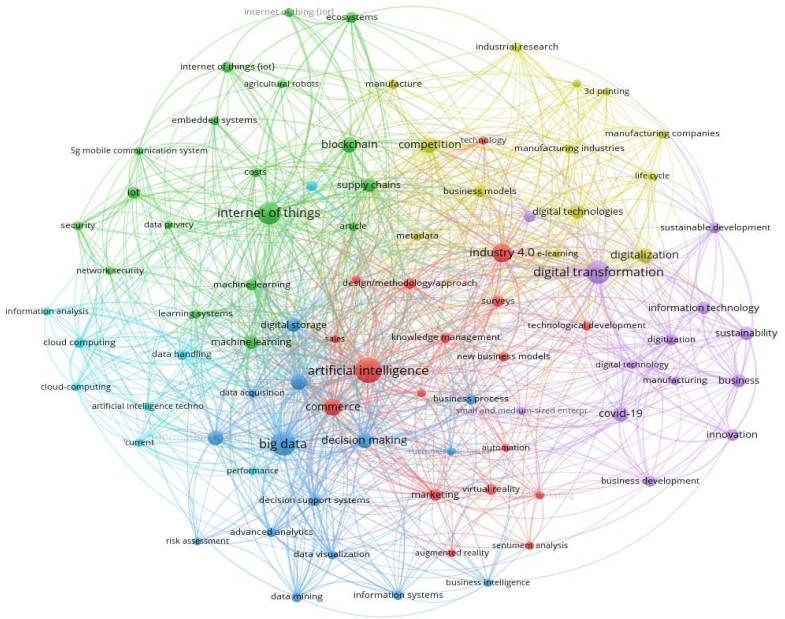

Fig. 5 Bibliometric analysis - network of manuscripts available in Scopus

Fig. 6 Overlay visualization of documents available in the Scopus database: word cloud

Cluster 1 (Red): Related to the integration and application of AI, new business models, virtual reality, and automation. These elements are central to the analysis, encompassing terms such as artificial intelligence, new business models, virtual reality, automation, etc.

Cluster 2 (Blue): Related to information analysis and data management, including technologies such as Artificial Intelligence (AI), data visualization, and big data analysis, including big data, artificial intelligence technology, automation, etc.

Figure 6 shows, through a bibliometric analysis, the visualization of a word cloud concerning the systematized manuscripts.

4. Discussion

In order to answer the objective of this study, the following questions were posed:

RQ1: In which database are there more studies on industrial process automation through emerging technologies?

For the present investigation, a total of 73 relevant articles were examined, obtained from different sources such as Scopus(7), EBSCO Host(38), Science Direct(4) and Proquest (24), as shown in Table 2.

Table 2. Articles by database

Database	Quantity	References
Scopus	7	[16-22]
EBSCO Host	38	[23-60]
Science Direct	4	[61-64]
ProQuest	24	[65-88]

RQ2: In which countries have the most studies been published on the automation of industrial processes through emerging technologies?

Table 3 shows the number of articles extracted by country, with the largest number of studies in countries such as Switzerland(12), China(10), Spain(6), India(5), among others.

Table 3. Articles by country

Country	Quantity	References
Switzerland	12	[65-67, 69, 73, 75, 81-83, 85, 86, 88]
Spain	6	[34, 61, 63, 68, 72, 78]
Iceland	1	[70]
United States	3	[38, 41, 71]
Poland	1	[74]
Colombia	4	[25, 39,40, 76]
Romania	4	[17, 77,79, 80]
Romania	2	[60, 84]
Croatia	2	[58, 87]
Portugal	2	[27, 62]
Brazil	2	[24, 30]
India	5	[28, 29, 31, 57, 64]
Turkey	1	[32]
Chile	2	[35, 56]
Peru	2	[16, 33]
Germany	3	[21, 42, 54]
Iran	1	[36]
Taiwan	1	[19]
China	10	[20, 22, 44, 45, 47-50, 52, 53]

Italy	1	[46]
Vietnam	1	[51]
Austria	1	[55]
England	1	[59]

RQ3: In which year were the most studies published on industrial process automation using emerging technologies?

Inclusion criteria were applied in order to select studies between the years 2020-2024. The largest number of studies was obtained in the year 2023.

Table 4. Articles by year

Year	Quantity	References
2020	12	[21, 27, 50, 53-55, 59, 60, 71, 76, 79, 84]
2021	9	[23, 26, 31, 40, 44-56, 75, 78]
2022	23	[19, 20, 24, 28, 32, 37, 39, 43, 46-49, 51, 52, 58, 66-68, 70, 72, 77, 81, 86]
2023	24	[16, 18, 22, 29, 30, 33-36, 38, 41, 42, 57, 62, 64, 65, 63, 73, 74, 80, 82, 83, 85, 88]
2024	5	[17, 25, 61, 63, 87]

RQ4: What problems do emerging technologies solve in industrial process automation?

This study allowed us to identify how technology allows us to solve problems in industrial processes through automation, especially operational inefficiency (48) and human error (19). The details are shown in Table 5 below.

Table 5. Problems solved by technologies through process automation

Problems	Quantity	References
Human error	19	[22, 23, 29, 33-35, 39, 43, 45, 46, 56, 67-70, 73, 76, 79, 81,]
Operational inefficiency, unproductivity: consumption of resources (time, money, effort, materials)	48	[18, 20-22, 25, 27-31, 33, 34, 37, 38, 40, 42, 44, 45, 47-50, 52, 53, 55, 60, 62, 63, 65-67, 70, 74, 76-85, 87, 88]
Difficulty to scale up	4	[17, 22, 35, 41]
High costs	11	[16, 17, 20, 27, 36, 46,52, 67, 77, 84, 86][16]
Poor customer experience	12	[19, 24, 3232, 35, 43, 54, 57-59 71, 74]
Cyber insecurity	2	[26, 75]
Accurate diagnostics	6	[44-46, 51, 52, 61]

RQ5: What are the sectors that benefit from the implementation of emerging technologies in industrial process automation?

The sectors that benefit most from the implementation of automation technologies are the “Services and customer relationship management” (8) and “Manufacturing industry, industrial processes” (12), and others. The result can be seen in Table 6.

Table 6. Sectors benefiting from the implementation of emerging technologies in the automation of industrial processes

Sectors	Quantity	References
Services and customer relationship management	8	[24, 29, 30, 32, 33, 35, 57, 74]
Financial and accounting services	7	[18, 19, 20, 33, 45, 53, 84]
Distribution management	2	[33, 52]
Banking	2	[27, 71]
Logistics and Transportation	6	[22, 38, 46, 48, 55, 82]
Food supply	5	[21, 31, 52, 66, 83]
Manufacturing industry, industrial processes	12	[17, 20, 22, 26, 38, 43, 49, 54, 76, 77, 79, 81]
Agriculture	3	[28, 85, 88]
Human Resources	1	[39]
Education	3	[37, 44, 58]
Information and communication technology	2	[75, 86]
Security	1	[80]
Linguistics	1	[69]
Audits	1	[70]
Construction	3	[56, 65, 87]
Medicine	4	[51, 61, 63, 73]
Journalism	3	[68, 72, 78]
Textile Industry	1	[36]
E-commerce	3	[47, 58, 59]
Sports	1	[50]
Tourism	1	[60]

RQ6: What are the trends used in companies for the optimization of industrial processes with the processes with the help of emerging technologies?

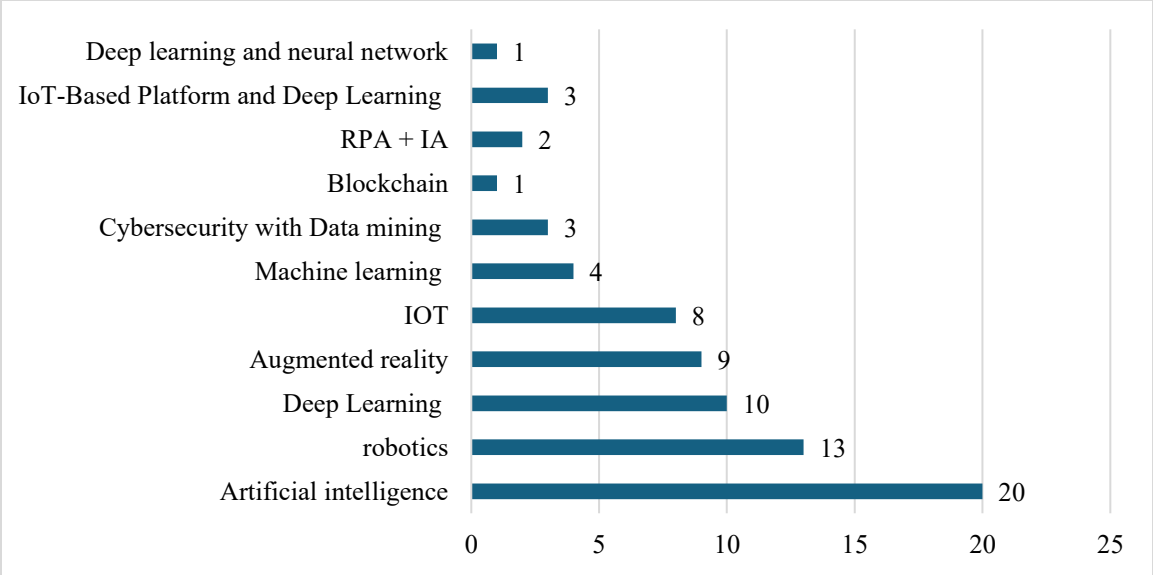

Fig. 7 Trends in industrial process automation using emerging technologies

Figure 7 shows the articles that evidence the use of emerging technologies in industrial processes, highlighting artificial intelligence (20), followed by robotics (13), Deep Learning (10), Augmented reality (9), IOT (8), Machine learning (4), Cybersecurity with Data mining (3) and finally Blockchain (1), Deep learning and neural network (1), IoT-Based Platform and Deep Learning (3), RPA + IA (2).

RQ7: What impact have emerging technologies had on the automation of industrial processes?

Emerging technologies in industrial process automation have significantly impacted productivity and efficiency, as shown in Table 7.

Table 7. Impact of new technologies on the automation of industrial processes

Impact	Quantity	References
Economic growth	2	[41, 45]
Market growth	5	[17, 23, 45, 69, 71]
Performance management optimization	29	[17, 24, 25, 31, 44-47, 50 54, 59, 65, 69, 70-72, 74-77, 79, 81-88]
Marketing cost reduction	12	[16, 36, 69-71, 79, 81, 84-88]
Improved user experience	11	[19, 32, 35, 44, 56, 57, 60, 63, 69, 71, 86]
Risk mitigation	16	[20, 27,46, 55, 61, 63, 66, 69-73, 75, 79, 80, 88]
Improved productivity and efficiency	39	[16, 18, 21, 22, 44, 45, 47-53, 58, 62, 63, 67-88]

Finally, several emerging technologies applied to business process automation between 2020 and 2024 were identified throughout this systematic review. While multiple studies presented positive results in operational efficiency and cost reduction through tools such as RPA, Machine Learning and AI, this research went further in several key aspects.

Unlike many publications focusing on a single technology (e.g., RPA alone or AI alone), this work offers an integrative view that evaluates the synergy between multiple technologies. By comparing combinations such as RPA + AI, IoT-Based Platform and Deep Learning, deep learning and neural network [53][85][89], it was observed that studies employing hybrid approaches report more significant improvements in the reduction of operational errors. Automating unstructured processes, such as customer service or document analysis, was traditionally beyond classic technologies' reach.

5. Conclusion

The trends in emerging technologies that allow better automation of industrial processes are based on artificial intelligence, followed by robotics, deep learning, augmented reality, Iot, machine learning, cybersecurity, data mining and blockchain. Similarly, most of the authors of the articles reviewed rely on a parameter to produce their articles focused on automating processes or tasks developed by machines. In addition, the areas where emerging technologies for the automation of industrial processes are applied are classified as “Manufacturing industry, industrial processes”, “Services and customer relationship management”, “Financial services, accounting”, and “logistics and transportation”. The results of this systematic review are helpful for future research to search and learn about emerging technologies used in industrial areas, allowing the automation of intelligent, efficient and

sustainable tasks. The implementation of emerging technologies is being deployed on a large scale worldwide, hence the importance of continuing to analyze new studies exclusively on implementation where emerging technologies improve industrial processes. It is recommended that future research delve deeper into the evaluation of the long-term impact of automation on indicators such as job satisfaction, operational sustainability and organizational resilience.

It would also be relevant to explore the role of organizational culture as a facilitator or barrier in technological adoption processes. In addition, it is suggested that comparative studies be carried out between different industrial sectors or companies of different sizes to identify patterns of success and possible risks associated with the automation of processes through emerging technologies.

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