

The integration of ERP systems and technologies for process automation: an analysis of the literature

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Annotation. In the context of Industry 4.0, economic entities that want to be successful on the market have to take into consideration the use of various technologies for digitalisation and automation of operational processes. To facilitate work and increase performance, ERP (Enterprise Resource Planning) systems can be integrated with other innovative solutions for automation, such as RPA (Robotic Process Automation). This paper aims to identify the main topics of interest in the field and the correlations between them by using a bibliometric literature analysis. The database included 284 publications extracted from Scopus. The search was carried out using keywords such as 'ERP', 'RPA', and 'automation'. Using the VOSviewer software, the answers to the research questions were obtained by analysing keyword co-occurrence network, the evolution of the number of papers published in the period 2015–2024, the papers with the highest number of citations, the representative authors, the sources that include the largest number of publications, and the countries that contributed the most to the field. The results illustrate that there is an increasing interest in the integration of ERP systems with digitalisation and automation technologies. In the analysed papers, automation-based solutions, such as software robots, are mainly chosen. The current research contributes to the literature by exploring the integrated use of ERP solutions with RPA, an aspect that is not much addressed in existing work. An overview of trends takes shape as this study can represent the basis for future research in this particular, continuously evolving field.

Keywords: ERP – Enterprise Resource Planning, RPA – Robotic Process Automation, economic processes, process automation technologies, literature review.

JEL classification: M15, O33, L86, M21.

Introduction

Nowadays, digitalisation is an essential factor for economic entities in different industries that want to grow and remain relevant in the public eye. They use various digitalisation and automation solutions to optimise processes and increase profitability (Yang, Yee, 2022). In recent years, there has been great interest in technologies based on artificial intelligence, with new skills to efficiently manage large volumes of data (Ritter, Pedersen, 2020). However, it is important to note that if a new solution for

process management is to be implemented, a reorganisation of existing resources must be considered (Yang, Yee, 2022). In this way, enterprises will be able to face the challenges in the market.

A well-known solution used by economic entities over the years to improve processes and resource management is ERP (Enterprise Resource Planning) systems. They can be integrated with other technologies used for digitalising activities, such as RPA (Robotic Process Automation). By combining ERP and RPA, costs are substantially reduced, processes are managed efficiently, the risk of errors is minimised and staff can focus on tasks that require human expertise (Yendluri *et al.*, 2023). In this context, the question of the present study is: *How has the scientific literature evolved in the field of ERP systems and process automation technologies integration in recent years?*

To answer this research question, a bibliometric analysis of the existing literature on the integration of ERP systems with other automation technologies, in particular RPA solutions, was performed using the methodology proposed by Donthu *et al.* (2021). To better outline the results obtained, tables, figures, and graphs have been created using VOSviewer software. A total of 284 relevant publications in the field, extracted from the Scopus academic database, were analysed, presenting the most studied topics, the evolution of the number of papers published in the analysed period, the types of papers included in the database, the countries where the most papers were published, both the authors and the sources with the highest number of publications in the field and the most cited studies. It will highlight aspects related to the usefulness of technologies now and future directions, with a focus on the benefits generated within economic entities.

This study is relevant for researchers, for it addresses interesting and relatively new topics such as the integration of ERP with solutions for process automation, representing a good start for future in-depth research. Compared to the already existing literature review studies, the focus of the current paper is on the integration of ERP with RPA, a topic that is yet to be addressed. Previous studies cover subjects such as the use of ERP with blockchain (Sunmola, Lawrence, 2024; Isbaih *et al.*, 2024), cloud ERP solutions (Tongsuksai, Mathrani, 2020), the integration of Business Process Automation (BPA) within entities (Moreira *et al.*, 2024), and the use of RPA in audit processes (Almayyahi *et al.*, 2024).

The paper is organised into several sections. The next section is the literature review, followed by the research methodology, in which the study steps are described. The following section presents the results of the research. The paper ends with conclusions.

1. Literature Review

In recent years researchers increasingly published papers on the importance of automating and digitalising operational processes. ERP systems, RPA tools, AI-based solutions, blockchain, and many others are considered revolutionary technologies used to improve various processes (Moreira *et al.*, 2024). This study will focus on the integration of ERP and RPA, a relatively new and little addressed topic in the literature.

In ERPs, information from multiple departments is integrated into a single platform, facilitating quick access to data (Ali, Miller, 2017). The use of ERP systems can lead to optimal resource management and increase the performance of the economic entity (Ali, Miller, 2017; Ratchatawetchakul *et al.*, 2024). The successful implementation of an ERP system requires that the project teams are trained as well as possible, that there is effective communication between the staff, that the objectives and operational

needs are properly established, and that the management pays particular attention to the project that is to be implemented (Ali, Miller, 2017).

As early as the 1960s, various generations of ERP systems started to be developed, leading to a complete version in the 1990s (Costa *et al.*, 2016). The ERP systems provide users with specific modules for managing human resources, production, sales processes, financial aspects, and much more, depending on the specifics of each entity (Nazemi *et al.*, 2012; Ratchatawetchakul *et al.*, 2024; Yendluri *et al.*, 2023). ERP systems support communication and cooperation between employees. The most well-known ERP systems suppliers are SAP SE and Oracle Corporation (Costa *et al.*, 2016).

Process automation technologies generate robots that can be programmed to automatically perform repetitive and rule-based tasks (Costa *et al.*, 2022). The robot can imitate the actions performed by an employee of an entity, but its role is not to replace the human factor, instead to support it (Costa *et al.*, 2022). Software robots generated using RPA technologies automate repetitive tasks and can interact with various platforms, reducing the execution time of the process (Yendluri *et al.*, 2023). The amount of staff workload is significantly reduced, allowing employees to allocate their time to strategic activities or to interpret the results obtained (Yendluri *et al.*, 2023). A survey has shown that employee job satisfaction improves when the tasks performed are valuable to the enterprise (Özkan, Esgin, 2023).

Important benefits for the economic entities that integrate RPA technologies into their operational processes are increased efficiency, reduced number of errors, and improved customer satisfaction (Hartley, Sawaya, 2019). A significant advantage may be low implementation costs compared to the cost of other solutions based on automation (Hofmann *et al.*, 2020).

At the same time, many tasks are suitable to be performed automatically by software robots, such as filling in data forms, managing e-mails, generating offers, or processing payments (Hartley, Sawaya, 2019). Most economic entities that choose to use RPA tools implement one of the solutions offered by Automation Anywhere or UiPath (Hartley, Sawaya, 2019).

According to Yendluri *et al.* (2023), economic entities that have integrated both ERP systems and RPA solutions into their processes benefit from lower costs and fewer errors, optimised workflows, and an efficient allocation of resources. Once the choice is made to use both ERP and RPA technologies, the enterprise is organised as a chain of interrelated processes that facilitate transparency and operational efficiency (Stoykova *et al.*, 2022).

Some of the activities that software robots can execute within the ERP systems include data entry, extraction and transfer, document generation, and system navigation based on predefined conditions (Stoykova *et al.*, 2022). In addition to the above, Ratchatawetchakul *et al.* (2024) demonstrate how a robot created using the RPA solutions provided by the UiPath platform leads to the completion of purchasing and production related processes in much shorter time than if they are executed manually by the entity's employees. There have also been observed improvements in the finance and human resources departments. An analysis of three companies in Romania, which use an ERP system, has been carried out on the chosen process automation option (Banța *et al.*, 2020). It was found that human errors were reduced by 28% for companies that integrated RPA solutions (Banța *et al.*, 2020).

Therefore, the literature review shows the utility of integrating several automation and digitalisation technologies, such as ERP and RPA in economic entities. Each study highlights the benefits of using innovative technologies and their contribution to the automation of the processes. Even so, as this is a

relatively new approach, there is no in-depth research in this area. However, the existing ones represent a significant starting point for future studies. In the results section, a broader picture will be outlined by analysing the academic papers on ERP, RPA and automation in order to better understand their impact within an entity.

Table 1. The Presentation of Information on Literature Review Publications

Study	Research aim	Data sources	Time range	Sample (size, type)	Review method (analytical procedures)	Place of research	Aspects
Sunmola and Lawrence (2024)	Identifying key success factors for integration of blockchain with ERP	Science Direct, Emerald Insight, IEEE Xplore, MDPI	2019–2023	30 publications	Systematic literature review	Worldwide	The use of blockchain and ERP systems both separately and together; success factors for ERP and blockchain integration in three contexts: organisational, technological, and regulatory.
Isbaih et al. (2024)	Exploring the integration of blockchain technology with ERP systems	Scopus	2018–2023	66 publications	Systematic literature review; bibliometric analysis of publications	Worldwide	Benefits and challenges of ERP and blockchain integration.
Tongsuksai and Mathrani (2020)	Exploring the integration of cloud ERP systems with Industry 4.0 technologies	Web of Science, IEEE Xplore, Wiley Library, Scopus, ACM library, Science Direct	2013–2020	16 publications	Systematic literature review	Worldwide	The benefits of integrating cloud ERP systems with new technologies in the Industry 4.0; which solutions can be integrated with a cloud ERP.
Moreira et al. (2024)	Analysing the implementation of BPA in SMEs	Scopus, Web of Science, Science Direct	2016–2023	More than 300 publications	Systematic literature review	Worldwide	Identification of processes that can be automated; technologies useful for BPA (such as RPA and ERP); factors that can influence the BPA procedure.
Almayyahi et al. (2024)	Applying RPA in audit to improve performance and reduce fraud	Google Scholar, Scopus, ResearchGate, Science Direct, ProQuest	-	22 publications	Literature review	Worldwide	How RPA technologies can be implemented in audit processes; benefits and challenges of using RPA in auditing; the importance of using artificial intelligence in auditing.

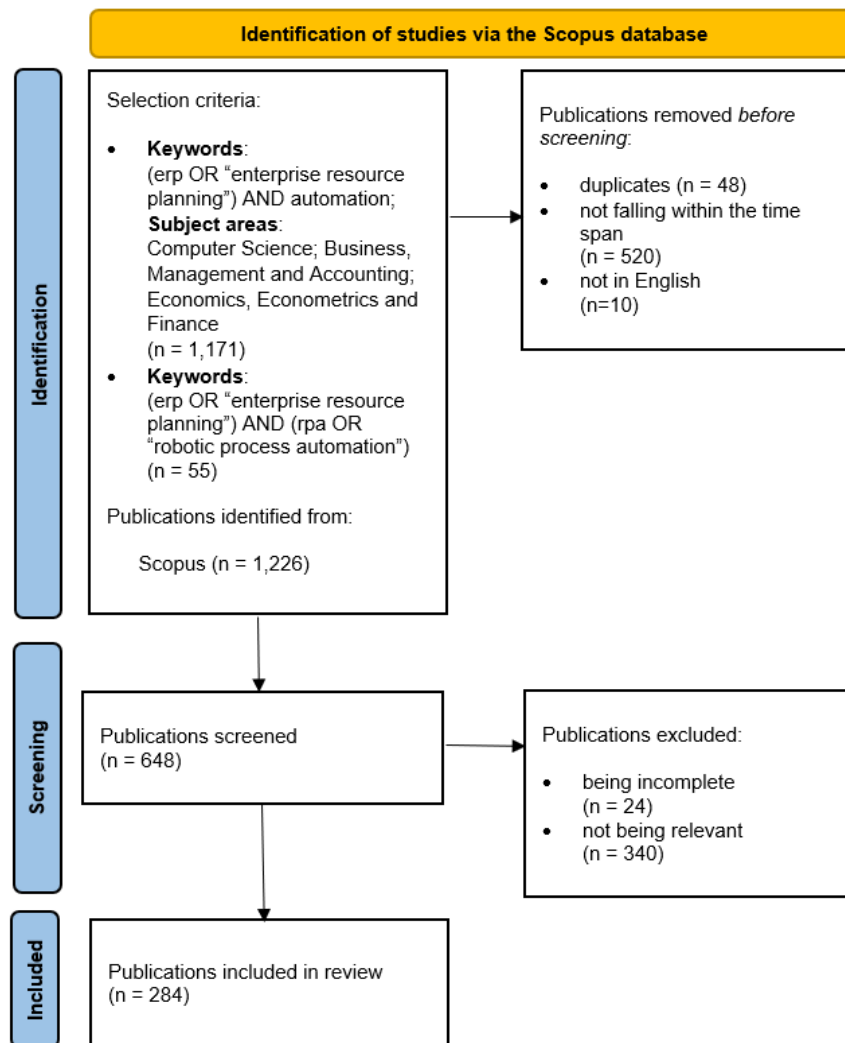
Source: created by the authors.

Previous studies do not contain any literature review studies addressing ERP and RPA integration. Thus, the current study fills a gap in the literature in this area, focuses on the investigation of recent technologies and can be useful for researchers and practitioners. The literature review papers focus on the use of ERP in conjunction with other technologies such as blockchain and the integration of

automation solutions such as RPA or BPA within economic entities. In *Table 1*, a summary of these literature reviews is presented.

2. Methodology

This research aims to conduct a bibliometric study in order to identify existing trends in the literature on the integration of ERP systems with RPA or other solutions for automation. The methodology proposed by Donthu *et al.* (2021) was applied to review the academic literature to identify the most discussed topics and the connections between them. In order to better understand the selection process of the existing papers in the analysed database, *Figure 1* shows the steps followed according to the PRISMA guidelines (Page *et al.*, 2021).



Source: authors' own research based on PRISMA guidelines.

Figure 1. PRISMA Flow Diagram for Bibliometric Analysis

On 19/12/2024, 1,226 academic papers were extracted from the Scopus scientific database, which indexes journals from different fields. After analysing existing papers indexed in the commonly used databases, it has been decided that Scopus is the most suitable for the current study, as it contains a wide range of publications on the selected topic.

Publications have been searched using keywords such as ‘ERP’ or ‘Enterprise Resource Planning’ and ‘Automation’. In order to keep only papers that are of real interest for the research, several filters have been applied on the obtained database. A selection criterion was applied on the subject area, choosing ‘Computer Science’, ‘Business, Management and Accounting’ and ‘Economics, Econometrics and Finance’. Another search was carried out using the following terms: ‘ERP’ or ‘Enterprise Resource Planning’ and ‘RPA’ or ‘Robotic Process Automation’, but it was noticed that most of the publications were already included in the database obtained in the first search. Therefore, the two resulting databases were merged and duplicates were removed.

Papers selected for analysis were published between 2015 and 2024. This time period was chosen due to the fact that the concepts under investigation are relatively new, with most of the relevant papers on the integration of ERP systems with automation technologies being published in this time range. The results were restricted according to the language in which they were written, in this case English. In addition, papers whose content was not fully available were removed. The papers that remained after filtering were manually analysed based on title and abstract content to ensure that they can all make a meaningful contribution to the analysis.

A total number of 284 publications was obtained and analysed using the software VOSviewer. This study aims to answer the following questions:

RQ1. Which terms are used the most frequently in publications on integrating ERP systems with RPA or other solutions for automation, and what are the correlations between them?

RQ2. What is the evolution of the number of publications between 2015 and 2024 related to the integration of ERP systems with RPA or other automation solutions?

RQ3. What is the distribution of types of publications related to the integration of ERP systems with RPA or other automation solutions?

RQ4. Which are the most cited publications on integrating ERP systems with RPA or other automation solutions?

RQ5. In which countries have most publications on the integration of ERP systems with RPA or other solutions for automation been published and what are the collaboration trends between them?

RQ6. What are the sources that have included the most publications on integrating ERP systems with RPA or other automation solutions?

RQ7. Which authors have contributed to the field with the most publications on the integration of ERP systems with RPA or other solutions for automation, and what are the connections between them?

Therefore, the methodology presented above was used to identify the most significant academic papers that were included in the research. In the results section, the conducted analysis will be described in order to discover the answers to the seven research questions.

3. Results and Discussions

In order to answer the research questions, the results of the analysis conducted on the basis of the publications extracted from the Scopus will be presented in the form of figures, graphs and tables, alongside their interpretation. It will include the analysis on the most used keywords, the number of

publications by year, the distribution of types of papers, studies with the highest number of citations, and also analysis of the countries that have contributed most to the development of the field regarding the integration of ERP systems with RPA solutions or with other technologies for digitalising and automation. Descriptive statistics are presented in the following table to give a clearer perspective on the literature reviewed.

Table 2. Descriptive Statistics

Item	Summary statistics
Time span	2015–2024
Sources (journals, books, etc.)	195
Documents	284
Average citations per document	7.49
Authors keywords	1,346
Additional keywords	3,104
Authors	837
Single-authored documents	40
Co-authors per document	2.9
Top five sources	1. CEUR Workshop Proceedings 2. Lecture Notes in Networks and Systems 3. ACM International Conference Proceeding Series 4. Advances in Intelligent Systems and Computing 5. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)

Source: authors' own research.

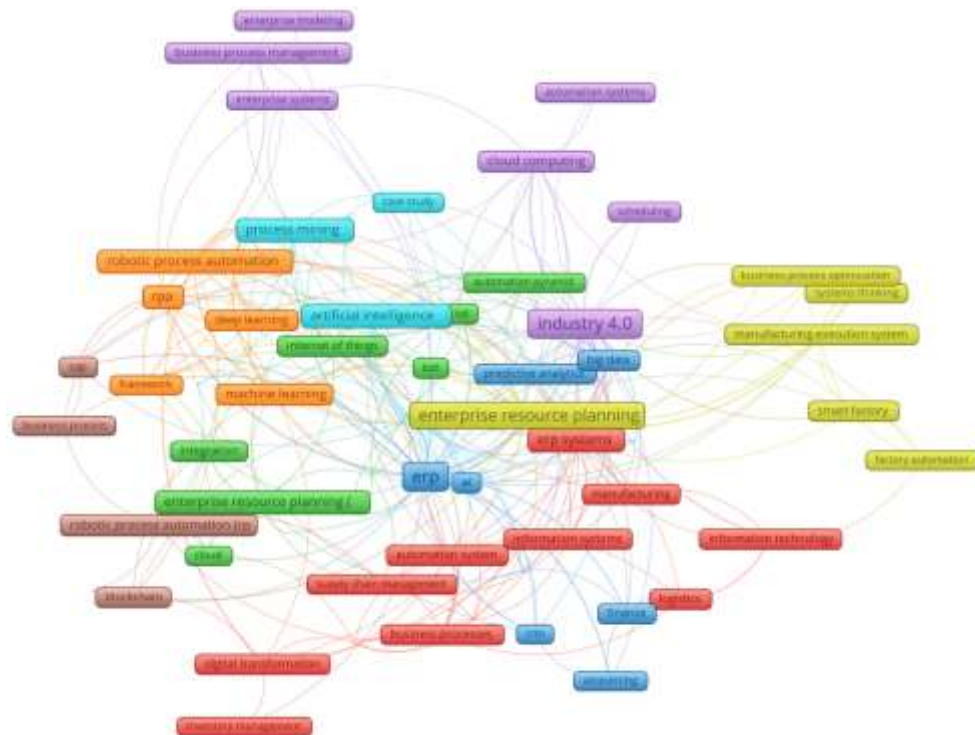
3.1 Analysis of the Author Keyword Co-Occurrence

This analysis will determine the most used keywords in the selected papers, in order to identify topics of interest in the field and the correlations between them. Using the VOSviewer software, the co-occurrence network of keywords with at least three occurrence was generated. In this way, 64 words were grouped into eight clusters. Each cluster is assigned a different colour, and the terms included in the clusters are categorised by topics of interest (Donthu *et al.*, 2021).

Figure 2 shows that it is possible to identify some of the main keywords, the top 10 with the highest number of occurrences being: 'erp', 'industry 4.0', 'enterprise resource planning', 'automation', 'erp systems', 'artificial intelligence', 'robotic process automation', 'enterprise resource planning (erp)', 'process mining', and 'rpa'.

In the generated figure, the nodes are represented by the keywords, and the size of the node is given by the number of occurrences of the word in the database papers (Donthu *et al.*, 2021). When analysing all the terms appearing in the previous figure, it can be observed that 'erp' has the highest number of occurrences, but also the highest total link strength (TLS). Thus, this is the main topic of interest for the analysed studies.

In addition, the nodes are interconnected in order to create an overview of the links between the relevant topics discussed in that area (Donthu *et al.*, 2021). The keywords 'robotic process automation' and 'rpa' are strongly connected to terms such as 'erp', 'business process', 'sap', 'artificial intelligence', 'blockchain', and 'machine learning', an aspect that can only represent the growing interest in the literature on the integration of innovative solutions for process improvement within economic entities.



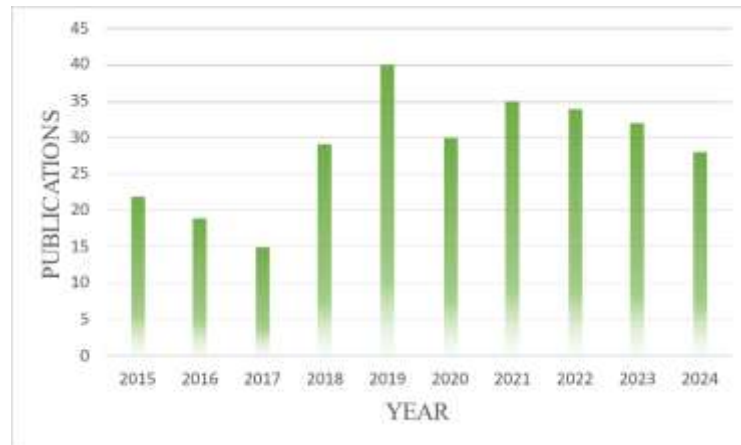
Source: authors' own research processed with the VOSviewer.

Figure 2. Keywords Co-Occurrence Network Visualisation

Additionally, it can be noted that the strongest connection is between 'erp' and 'rpa', compared to the one between 'erp' and other automation solutions. This shows that in the publications included in the analysed database, in most cases, software robots are used to optimise processes and simplify the tasks of employees, to the detriment of other types of innovative technologies.

3.2 Analysis of the Number of Publications per Year

It is possible to determine when a topic was most debated by researchers, as well as some important aspects concerning the development of the field, by analysing the evolution of the number of papers published in a particular period. As can be seen in Figure 3, with the passage of time and the emergence of new technologies, the number of academic studies presenting topics related to the integration of innovative tools for digitalising and automation in economic entities is increasing. Between 2018 and 2024, although there have been fluctuations in the number of publications, there has been an increase in academic interest in this field, compared to the first three years analysed.



Source: authors' own research.

Figure 3. Evolution of the Number of Publications per Year

The highest number of publications related to the integration of ERP systems and RPA solutions or other automation technologies is 40, which accounts for approximately 14% of the total number of papers in the analysed database, and was reached in 2019. Tongsuksai and Mathrani (2020) obtained the same results following an analysis of a database including papers related to the integration of cloud ERP with Industry 4.0 technologies, 2019 being the year in which most studies were also published on this topic. Further, following the content analysis of the publications, it can be observed that all the studies on the main topics related to the integration of RPA solutions were published after 2019. 35 and 34 studies on the integration of ERP with RPA or other automation solutions were published in 2021 and 2022, respectively. Therefore, 2019, 2021 and 2022 can be considered representative years for the field.

3.3 Analysis of the Number of Publication Types

The distribution of the types of publications in the Scopus-extracted database can be visualised in Table 3, highlighting the variety of types of studies in this field. After filtering the database, 173 conference papers remained.

Table 3. Distribution of Publication Types in Scopus

Publication Type	Number	Percentage
Conference paper	173	60.92%
Article	78	27.46%
Book chapter	27	9.51%
Book	3	1.06%
Review	2	0.7%
Editorial	1	0.35%
Total	284	100%

Source: created by the authors.

This is the most common type of publications analysed, which accounts for approximately 61% of the total number of analysed papers. Articles represent 27.46% of the total number of papers, more precisely a number of 78, followed by book chapters. Thus, according to the information shown in Table 3, researchers writing papers on topics such as the integration of ERP and RPA or other tools for process automation are predominantly choosing to present their results at conferences and to disseminate their

work in indexed academic journals. No trend could be observed between the type of publications and specific research topics or years of publication.

3.4 Analysis of the Number of Citations of Publications

It is possible to identify the studies that have contributed most significantly to the development of the field by analyzing the number of citations of publications in the database. The papers mentioned in *Table 4* are the most cited in the academic literature on the analysed topic. In the first four papers, ideas are outlined from a more general perspective with a focus on digital transformation and the influence of the emerging technologies on the way operational processes are carried out, without focusing on specific technologies. It can also be noted that, although the first three papers are recent publications, they have a high number of citations both in total and per year. Therefore, researchers have been recently paying particular attention to these topics.

Table 4. Top 20 Most Cited Publications

No.	Publications	Number of citations	Number of citations per year
1	Ivanov <i>et al.</i> (2021)	317	79.25
2	Balsmeier and Woerter (2019)	223	37.17
3	Hartley and Sawaya (2019)	141	23.5
4	Weichhart <i>et al.</i> (2016)	121	13.45
5	Zdravković <i>et al.</i> (2022)	52	17.33
6	Karimanzira and Rauschenbach (2019)	45	7.5
7	Marmolejo-Saucedo <i>et al.</i> (2020)	45	9
8	Werner <i>et al.</i> (2021)	44	11
9	Wang <i>et al.</i> (2016)	44	4.89
10	Badewi <i>et al.</i> (2018)	33	4.71
11	Xu <i>et al.</i> (2021)	27	6.75
12	Hadidi <i>et al.</i> (2017)	27	3.38
13	Majstorovic <i>et al.</i> (2020)	22	4.4
14	Antonino <i>et al.</i> (2019)	21	3.5
15	Salcic <i>et al.</i> (2019)	21	3.5
16	Wachnik (2022)	20	6.67
17	Shree <i>et al.</i> (2020)	20	4
18	Eros <i>et al.</i> (2019)	18	3
19	Liu <i>et al.</i> (2019)	18	3
20	Kannoth <i>et al.</i> (2021)	17	4.25

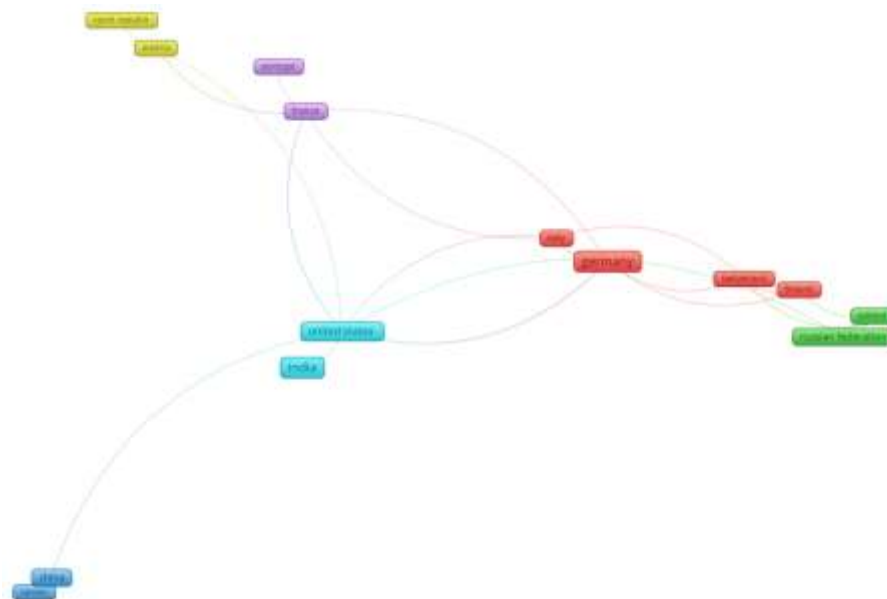
Source: created by the authors.

The table presents researches focusing on topics related to Industry 4.0, including the integration of ERP and innovative tools for making work easier (Shree *et al.*, 2020; Kannoth *et al.*, 2021; Wachnik, 2022), robots and automation (Xu *et al.*, 2021; Salcic *et al.*, 2019; Eros *et al.*, 2019), the use of ERP systems (Badewi *et al.*, 2018; Hadidi *et al.*, 2017; Majstorovic *et al.*, 2020), cloud computing used in small and medium enterprises (Wang *et al.*, 2016; Liu *et al.*, 2019), and other topics that add value to the literature. It is also relevant to mention that the majority of the most cited publications are academic articles. They illustrate new concepts that are of interest to researchers or useful solutions for economic entities.

3.5 Analysis of Countries with the Largest Number of Publications

Using the of analysis of the countries with the largest number of publications, it will be possible to identify the countries with the most publications on the use of ERP, RPA or other technologies for automation and also the collaborations between authors from different countries. As can be seen in

Figure 4, the countries of origin of the authors who wrote the most papers on the analysed topic between 2015 and 2024 are India, Germany, United States, Russia, and China.



Source: authors' own research processed with the VOSviewer.

Figure 4. Visualisation of the Co-Authorship Network by Country

Authors from both India and Germany published 33 papers; and authors from the United States, 24, together representing approximately 32% of the total publications in the database. Some of the reasons why these are the countries with the most published studies would be the high number of researchers, the existence of well-known institutions, and the research funds.

Collaboration networks between countries can also be identified. For example, the United States have a total link strength (TLS) of 9; and France, of 7. Thus, authors from the United States have two collaborations each with authors from France and Germany and one each with authors from India, China, Russia, Austria, and Italy. In addition to their two collaborations with the American authors, French researchers have worked on two other studies with researchers from Austria. Therefore, according to the geographical distribution of the publications in the database, it can be emphasised that the greatest interest in ERP systems, RPA solutions or other technologies used integrated within economic entities, is presented by developed or developing countries, which also relies on collaborations to increase the quality of the resulting academic work.

In addition to the above, it is important to note that there are two publications each from universities in Germany, Vietnam, India, and others, that have been relevant to the topic discussed and have a strong academic impact. At the same time, these have a high number of citations, with German universities having authors with research ranked in the top 20 publications with the most citations noted in *Table 4*.

3.6 Analysis of the Most Frequent Sources

The following discussion presents the analysis of the sources in the database that include the most publications on the integration of ERP systems with solutions for process automation, such as RPA. In the database there are 195 distinct academic sources, the top 10 most frequent of which are mentioned

in *Table 5*. The sources in the table are representative for the development of the field, where various topics on the use of new technologies for digitalisation are addressed. Most of the sources include publications that have been presented at conferences, which may be understandable considering that conference proceedings predominate in the analysed database. In addition, there are two book chapters in *Lecture Notes in Networks and Systems* and *Lecture Notes in Business Information Processing*.

Table 5. Top 10 Most Frequent Sources in the Database

No.	Sources	Number of publications	Number of citations
1	<i>CEUR Workshop Proceedings</i>	12	1
2	<i>Lecture Notes in Networks and Systems</i>	12	9
3	<i>ACM International Conference Proceeding Series</i>	11	46
4	<i>Advances in Intelligent Systems and Computing</i>	10	80
5	<i>Lecture Notes in Computer Science</i> (including subseries <i>Lecture Notes in Artificial Intelligence</i> and <i>Lecture Notes in Bioinformatics</i>)	8	30
6	<i>Lecture Notes in Business Information Processing</i>	6	27
7	<i>IFIP Advances in Information and Communication Technology</i>	4	31
8	<i>Procedia Manufacturing</i>	4	50
9	<i>Proceedings of the International Conference on Industrial Engineering and Operations Management</i>	4	5
10	<i>Procedia Computer Science</i>	3	15

Source: authors' own research.

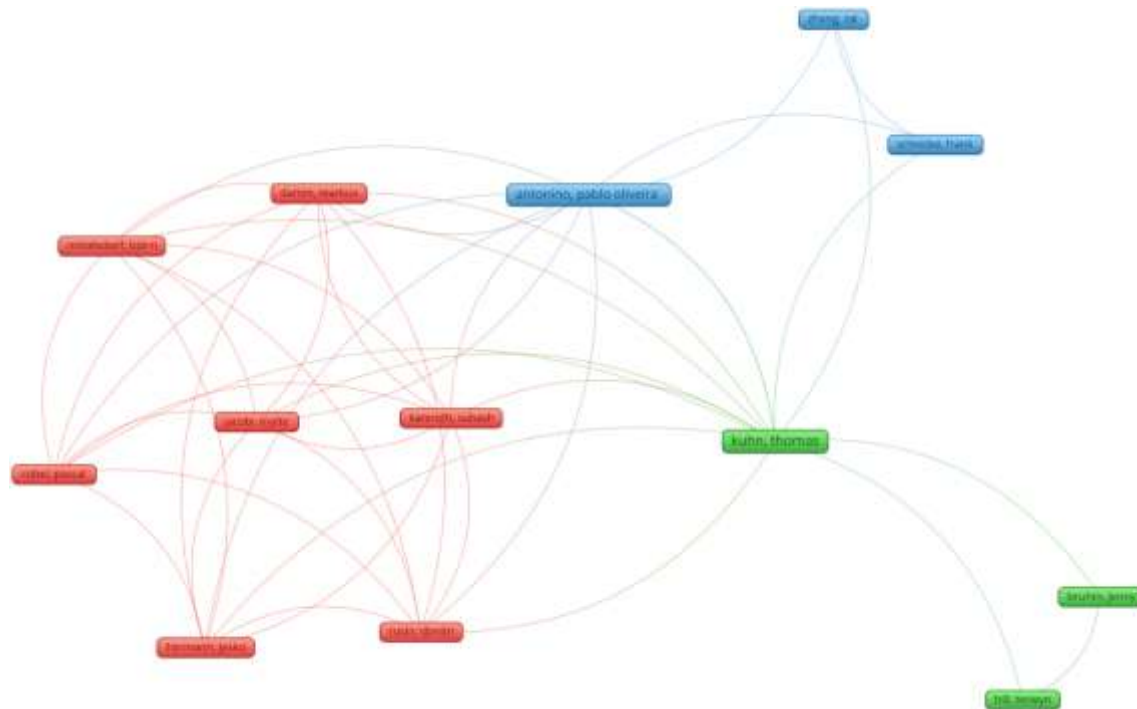
Both the *CEUR Workshop Proceedings* and *Lecture Notes in Networks and Systems* each include a total of 12 papers, closely followed by the *ACM International Conference Proceeding Series* in which 11 papers have been published. This source was also mentioned in the study conducted by Isbaih *et al.* (2024), taking the second position in the top journals that have contributed the most to the development of the field on the use of ERP systems and blockchain technologies.

Although the first two sources in the table cover a large number of studies, it can be observed that they are not notable for the number of citations. The third and fourth sources have both a large number of papers and a considerable number of citations. Even though the papers in these sources are published relatively recently, between 2017 and 2024, they have 46 and 80 citations, respectively. In each of these two sources, there is one published paper that ranks in the top 20 most cited publications listed in *Table 4*. Another important aspect to mention is that *Procedia Manufacturing*, placed eighth in the above table, includes only four papers but registers 50 citations, also having one research included in *Table 4*. Sources that have an increased number of papers and citations explore a variety of research topics and make significant contributions to the academic community.

3.7 Analysis of Authors by Number of Publications

The analysis of authors and correlations between them is useful to identify which researchers have published the most papers in the field of ERP system integration with process automation solutions such as RPA, and how they have collaborated to obtain relevant results and those of interest to the readers. The database contains 837 unique authors who have contributed to at least one paper. The authors with most papers are Thomas Kuhn, Stela Stoykova, and Arnesh Telukdarie. Each of them is mentioned as an author for three publications, which present topics related to the use of various innovative technologies

to make work easier within economic entities, ERP systems and solutions based on robots or artificial intelligence. Next, 34 authors appear in the database with two papers and the rest with one paper.



Source: authors' own research processed with the VOSviewer.

Figure 5. Co-Authorship Network Visualisation

According to Figure 5 illustrating the network of collaboration between authors, the researcher Kuhn Thomas stands out with three papers he co-authored, 13 total link strength (TLS) and 38 citations recorded. Therefore, it can be highlighted that there have been many collaborations between him and other researchers, and he can be considered a key author in the analysed field. It can also be noted that the authors Kuhn Thomas and Antonino Pablo Oliveira have the strongest connection. They worked together and with other researchers on two papers that received 17 and 21 citations, respectively. Both papers are mentioned in Table 4, in the top 20 most cited publications.

This analysis presents an overview of the authors who have published research in the field and the main collaborative networks that have been established between them.

Conclusions

In today's digitalisation era, economic entities are turning their attention to the use of the latest technologies that can generate numerous benefits, such as improving processes, reducing the risk of errors, maximising performance, and increasing employees' job satisfaction. Some of the technologies that can be easily integrated within an enterprise are ERP systems and RPA solutions, which have been presented in detail in the first part of the current study. However, these are not the only efficient options. Studies show that there are several types of Industry 4.0 specific technologies that can bring competitive advantages to the market.

With the help of a bibliometric analysis, it was possible to identify the main keywords used by the authors in studies on the integration of ERP systems with RPA or other automation solutions, these being ‘erp’, ‘industry 4.0’, ‘automation’, ‘artificial intelligence’, and ‘robotic process automation’. The bibliometric analysis was performed on a database that included 284 academic publications extracted from Scopus, the selected period being 2015–2024. The years in which the most research has been published are 2019 and 2021, and the predominant types of papers are conference proceedings and articles. The most frequently cited studies in the database are those that present an overview of innovative Industry 4.0 technologies, those that focus on the usefulness of ERP systems and their integration with other solutions, or papers that discuss the importance of using automation technologies based on robots. In the database, there are sources and authors who have contributed with their many publications to the development of the analysed field. The sources with the most papers are CEUR Workshop Proceedings and Lecture Notes in Networks and Systems; one author who has been notable both by collaborations and number of studies is Kuhn Thomas. At the same time, the collaborations between authors from countries such as United States, Germany, France can be noticed, but the country with the highest number of published studies is India. All these aspects are also illustrated in figures and tables to facilitate understanding of the analysis and the results obtained.

This study presents the importance of the integrated use of new technologies, such as ERP systems with RPA or other solutions based on automation and digitalisation, as well as emerging trends in the literature. The information described can be useful for economic entities that want to turn their attention to digitalisation in order to face the challenges that constantly arise on the market. Simultaneously, based on the current study, researchers can carry out more complex analysis, which is just a starting point for future work. Some aspects that could be mentioned regarding the limitations of the research include the use of a single database for the extraction of publications and the limited number of studies strictly related to ERP and RPA integration.

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VERSLO VALDYMO SISTEMŲ IR TECHNOLOGIJŲ INTEGRACIJA PROCESŲ AUTOMATIZAVIMUI: LITERATŪROS ANALIZĖ

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Santrauka. Atsižvelgiant į 4-osios pramonės revoliucijos (angl. Industry 4.0) kontekstą, ekonominiai subjektai, norintys sėkmingai veikti rinkoje, turi įvertinti įvairių technologijų, skirtų veiklos procesams skaitmeninti ir automatizuoti, naudojimą. Siekiant palengvinti darbą ir padidinti našumą, ERP (verslo valdymo) sistemas galima integruoti su kitais inovatyviais automatizavimo būdais, pvz., RPA (robotinių procesų automatizavimu). Straipsnyje siekiama nustatyti pagrindines dominuojančias šios srities temas ir jų sąsajas, pasitelkiant bibliometrinę literatūros analizę. Į duomenų bazę įtraukti 284 leidiniai, paimti iš duomenų bazės „Scopus“. Paieška atlikta naudojant reikšminius žodžius ERP, RPA, automatizavimas. Naudota programinė įranga „VOSviewer“. Į tyrimo klausimus atsakyta analizuojant reikšminių žodžių pasikartojimus, 2015–2024 m. publikuotų straipsnių skaičių, daugiausiai cituotus darbus, reprezentatyvius autorius, šaltinius su didžiausiu publikacijų skaičiumi bei šalis, labiausiai prisidėjusias prie tiriamosios srities. Rezultatai atskleidė, kad auga susidomėjimas ERP sistemų integracija su skaitmeninimo ir automatizavimo technologijomis. Nagrinėtuose straipsniuose daugiausia pasirenkami automatizavimu pagrįsti sprendimai, pvz., programiniai robotai. Šiuo tyrimu papildoma esama literatūra, nes nagrinėtas integruotas ERP sprendimų naudojimas su RPA – aspektas, kuriam esamuose tyrimuose skirta mažai dėmesio. Tyrime apžvelgtos tendencijos, tad jis gali tapti pagrindu būsimiems tyrimams šioje nuolat besivystančioje srityje.

Reikšminiai žodžiai: ERP – verslo valdymo sistemos; RPA – robotinių procesų automatizavimas; ekonominiai procesai; procesų automatizavimo technologijos; literatūros apžvalga.