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Robotic Process Automation: A Burgeoning Technology with Promising Prospects

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Abstract: Robotic Process Automation, a novel technology centered on automating repetitive, routine, and rule-based human tasks, offers significant benefits to organizations that adopt it. However, due to its relative infancy in the market, scientific research on RPA remains limited. This paper delves into the academic community's definition of RPA and its exploration in the literature, examining its current state, trends, and applications. It also elucidates the distinction between RPA and business process management. To achieve these objectives, a systematic literature review (SLR) was conducted using the Web of Science and Scopus databases. The paper presents the findings of the SLR on RPA, providing an overview of RPA definitions and practical applications, along with the benefits of its implementation across various industries.
Keywords: Robotic Process Automation, Literature Review, Business Process Management.

I. INTRODUCTION

The evolving global economy, fueled by technological advancements, necessitates increased agility and responsiveness among businesses to effectively address customer needs, preferences, and demands. Furthermore, competitive and financial pressures compel organizations to enhance efficiency, driving an incessant quest for innovative technologies and methodologies that can boost productivity, reduce expenses, and add value to their operations.

Robotic process automation (RPA) emerges as a transformative technology that can alleviate employees from repetitive tasks, enabling them to focus on more strategic and value-adding endeavors. Consulting firms recognize RPA as an emerging technology with demonstrated value creation. Numerous researchers have documented the benefits of RPA implementation (e.g., [7, 8, 16, 29, 39]). However, practical applications of RPA currently outpace research efforts. Therefore, a thorough examination of the similarities, differences, and complementary aspects between RPA and analogous technologies, such as business process management (BPM), becomes crucial. For instance, scholars advocate for exploring the integration of BPMS and RPA [33]. Additionally, Harmon's investigation into the BPM market revealed that 30% of surveyed practitioners aspire to incorporate RPA capabilities into their process modeling suites [20].

Therefore, aiming to properly understand RPA, to assess its relevance within the research community and to investigate its link to BPM, a systematic literature review (SLR) has been conducted. In that sense, this paper reports on three research questions related to the state and progress of the RPA research, its definition and practical usage, which are addressed in more detail later in this paper. Moreover, the paper aims to provide an understanding of the differences between RPA and BPMS.

To achieve the study's objectives and address the research questions, the paper is structured as follows. Following this introduction, the second section provides a concise overview of RPA, delving into its theoretical and practical aspects and its connection to BPM. The third section outlines the employed research methodology, encompassing the identification of research questions and the systematic literature review (SLR) protocol. Subsequently, the fourth section presents the research findings pertaining to the three research questions, followed by a comprehensive discussion in the fifth section. Finally, the sixth section concludes the paper.

II. REVIEW OF LITERATURE AND BACKGROUND ON ROBOTIC PROCESS AUTOMATION

A. Robotic Process Automation in Theory and Practice

Based on a preliminary literature review, RPA is defined as the application of specialized technology and methodologies, grounded in software and algorithms, aimed at automating repetitive human tasks [16, 21, 33, 39]. It is primarily driven by simple rules and business logic while interacting with multiple information systems through existing graphical user interfaces (GUIs) [17]. Its functionalities encompass the automation of repeatable and rule-based activities through the use of non-invasive software robots, referred to as "bots" [27, 29, 38].

RPA has gained significant traction in recent years as businesses seek to streamline operations, enhance efficiency, and reduce costs. Its ability to automate repetitive tasks frees up employees to focus on more strategic and value-adding activities, contributing to overall organizational success.

Recently, RPA definition is extended towards its conjunction with artificial intelligence (AI), cognitive computing, process mining, and data analytics. The introduction of advanced digital technologies allows RPA to be reallocated from performing repetitive and error-prone routines in business processes towards more complex knowledge intensive and value-adding tasks [3, 17, 45].

Forrester [15] conducted an assessment of the RPA market and identified 12 vendors offering enterprise-level, full-corporate solutions capable of supporting the demands of a "shared service" or enterprise-wide RPA utility. While some RPA vendors provide industry-specific solutions, Schmitz et al. [42] maintain that "the general concept of RPA is industry agnostic." Notably, partnerships between RPA vendors and leading artificial intelligence providers have enabled the expansion of traditional RPA functionalities with cutting-edge technologies such as self-learning from process discovery, robot training, AI-powered screen recognition, natural language generation, and automated process documentation generation [3].

A majority of 400 companies surveyed by Deloitte [10] have started on their RPA journey and almost a quarter more plan to do so in the next two years. They also report that payback periods are averaging around a year and their expectations of cost reduction, accuracy, timeliness, flexibility, and improved compliance are met or exceeded [10]. Forrester [15] estimates that by 2021, there will be over 4 million robots automating repeatable tasks, but the focus will be moved toward integrations with AI and improvements of RPA analytics. Similarly, Everest Group [12] points out that though a majority of buyers are highly satisfied with RPA solutions, they require the enhancement of analytics and cognitive capabilities. Despite the substantial benefits of RPA, only a small percentage of companies have embraced this technology at scale. Deloitte's research [10] reveals that only 5% of surveyed organizations have implemented more than 50 RPA robots into their operations. The success of RPA projects hinges on organizational readiness and a clear understanding of business objectives. Key challenges hindering process automation include a lack of understanding of RPA's capabilities and potential applications, inadequate management support, and employee concerns over job displacement [43]. Bridging the gap between RPA as an IT tool and its integration into business operations requires a comprehensive change management strategy, organizational culture shift, and a mindset recalibration [10, 28, 43]. Furthermore, Everest Group's study [13] highlights the importance of robust customer support, training materials, RPA maintenance services, and a well-established RPA vendor ecosystem as critical drivers of RPA adoption. The introduction of new technologies also raises questions about robot management, centralized control, and governance [15].

B. Robotic Process Automation and Business Process Management

As previously discussed, it is essential to explore the parallels, distinctions, and complementary aspects of RPA and analogous technologies. Given that RPA and BPM are closely related disciplines with synergistic goals, Mendling et al. [33] advocate for the BPM research community to delve into the integration of business process management systems (BPMSs) and RPA.BPM is a multidimensional approach aiming to achieve better business performance through continuous process improvement, optimization and digital transformation. BPMS as a holistic software platform that encompasses a wide range of functionalities such as process design, analytics, and monitoring is very often one of the BPM initiative inevitable perspectives [6]. On the other side, RPA deals with discreet, repetitive tasks and execute processes as a human would. According to Cewe at al. [8] "BPMS is used to orchestrate end-to-end process, and to manage human, robots and system interactions, RPA is responsible for repetitive sequences of tasks that can be fully delegated to software robots".

Though these technologies are very often used separately, the authors from business practice [14, 36] strongly suggest combining both to gain even more business value. In a case of the lack of resources and/or time to completely implement BPMS, RPA can be a valuable and relatively inexpensive tool to solve or complement some of the unfulfilled goals.

III. RESEARCH METHODOLOGY

A. Identification of Research Questions

The preliminary literature overview (summarized in Section 2) underscored the relevance of RPA for both business professionals and researchers, while also highlighting the paucity of systematic literature reviews (SLRs) in the RPA domain. Initial findings revealed gaps in research contexts, the absence of robust theoretical frameworks, and inconsistencies in the definition and scope of RPA. Moreover, a snapshot of recent RPA literature indicated that RPA is widely recognized in business practice as a catalyst for performance enhancement. While numerous benefits and challenges associated with RPA implementation were discussed, the need to systematically capture and analyze experiences from business practice regarding RPA utilization was emphasized.

Lastly, the debate surrounding RPA as a burgeoning facet of BPM was evident in both professional and academic literature. Following the previous annotations about scientific and professional papers that focus their attention on RPA, the research questions are determined. They are defined from more general to more specific, as follows:

- RQ1 How far has research on RPA has progressed?
- RQ2 How is RPA defined (RQ2-1) and what is a difference between RPA and BPMSs according to the researchers (RQ2-2)?
- RQ3 How is RPA used in business practice, as mentioned in the scientific literature?

While RQ1 is related to the results of bibliometric analysis, the answers on RQ2 and RQ3 are grounded on the qualitative outcomes from the detailed content analysis of the sampled articles.

B. Systematic Literature Research Protocol

To fulfill the objectives of this paper and address the research questions, a systematic literature review (SLR) approach was adopted. The SLR methodology, initially developed in medical research, has gained prominence in management and information systems field research over the past two decades due to its ability to systematically synthesize knowledge from existing research and ensure the reliability, comprehensiveness, and quality of findings [32, 35, 44, 48]. Following a typical SLR guideline [5, 24], our literature retrieval involved a three-step process:

SLR protocol definition and literature search and selection: A research protocol was designed and presented (Table 1) to guide the literature search and selection process. The search strings were constructed using the keywords "robotic process automation" and applied to two comprehensive digital databases, Scopus and Web of Science Core Collection (WoS). These databases were chosen to capture articles from both social sciences and information systems fields, reflecting the interdisciplinary nature of RPA research. The search was not restricted to a specific time period, field, or index to ensure a comprehensive understanding of RPA research evolution.

Quality appraisal and extraction of relevant articles: The retrieved articles were screened based on predefined quality criteria to ensure the inclusion of high-quality, relevant studies. This step involved evaluating the articles' relevance to the research topic, their methodological rigor, and their contribution to the existing body of knowledge. Qualitative analysis and synthesis of the accepted articles: The accepted articles underwent a thorough qualitative analysis to identify key themes, patterns, and insights related to RPA research. The extracted information was synthesized to provide a comprehensive overview of the current state of RPA research and identify potential research gaps and future directions. As a result of our search 46 articles were found (12 in WoS and 34 in Scopus). After excluding the duplicate articles, 36 articles remained (8 in both WoS and Scopus, 2 only in WoS, 18 only in Scopus).

Table 1. RPA research protocol

SLR Protocol element	Translation in RPA research
Digital sources	Scopus and Web of Science Core Collection (WoS).
Searched term	Robotic process automation.
Search strategy	No publication date limit; no topic limit; search term contained anywhere in the articles; articles and conference papers only (no editorial, review, conference review).
Inclusion criteria	Search string “robotic process automation”
Exclusion criteria	Articles without full access; extended abstracts (without full text); book chapters; professional papers; articles citing the term “robotic process automation” with a different meaning.

During step 2, several exclusion criteria were applied to refine the pool of retrieved articles. As our focus was on peer-reviewed journal articles and scientific conference papers, articles lacking full access (2), extended abstracts only (2), and those mistakenly classified as peer-review articles (1 book chapter and 1 professional paper) were excluded. This resulted in a total of 30 potentially relevant articles for further analysis.

To ensure alignment with the objectives of this research, the abstracts of all 30 articles were scrutinized to determine their relevance. Guided by the definition of RPA presented in the preliminary literature overview (Section 2.2), which defines RPA as a software robot that automates repeatable and rule-based activities, three articles with a different interpretation of "robotic process automation" were identified and excluded. Consequently, 27 articles were deemed relevant and extracted for in-depth analysis. A comprehensive list of the articles retrieved through the SLR process is provided in the appendix.

Step 3 of our SLR protocol is where the selected research articles were further analyzed based on the full text reading and codded by using the programs MS Excel and NVivo. The quantitative results from MS Excel were used to answer RQ1, while the results of the qualitative analysis conducted in NVivo gave the answers to RQ2-RQ3.

IV. RESEARCH RESULTS

A. SLR Results: the State and Progress of Research on RPA

This section addresses RQ1 by presenting the fundamental bibliographic findings gathered from the analysis of the coded fields: 'Year of publication', 'Publication outlet' (journal or conference proceeding), 'Study strategy' (theoretical, empirical, or review), and 'Journal title'.

Figure 1 presents a publishing frequency (2016-2018) regarding publication outlet. A total of 20 out of 27 articles were published in 2018, among which 14 conference papers and 6 journal articles. Only 4 journal articles and 3 conference papers were published in 2016 and 2017.

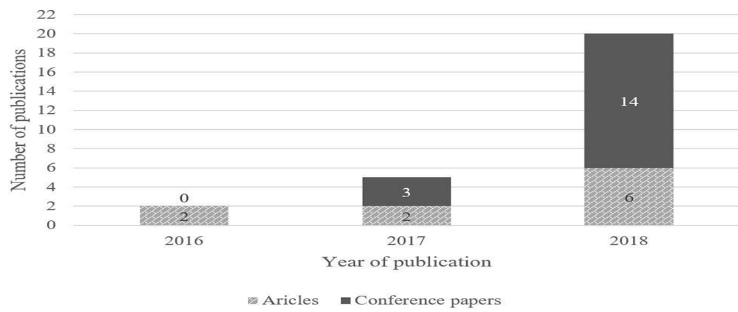

Fig. 1. Appearance of RPA articles by publication year (2016-2018) and the publication outlet

Methodologically, the articles are categorized into three study strategies: empirical research (qualitative or quantitative), theoretical application, and literature review. The majority of the articles (18) employed an empirical research strategy, with 16 qualitative studies (12 case studies and 4 reviews of specific RPA technologies) and 2 quantitative studies (questionnaire surveys) identified. Half (6) of the case study articles were published in peer-reviewed journals. A theoretical applied approach was adopted in 4 articles (1 journal article and 3 conference proceeding articles), while 5 articles (2 journal articles and 3 conference proceeding papers) presented literature review findings. Within this category, only 1 was an SLR article. Figure 2 illustrates the distribution of articles according to their methodological approach. The Journal of Information Technology Teaching Cases and MIS Quarterly Executive published the most RPA papers, with four and two articles respectively. The majority of conference proceedings papers originated from the ACM International Conference Proceeding Series and Lecture Notes in Business Information Processing series, both with three publications.

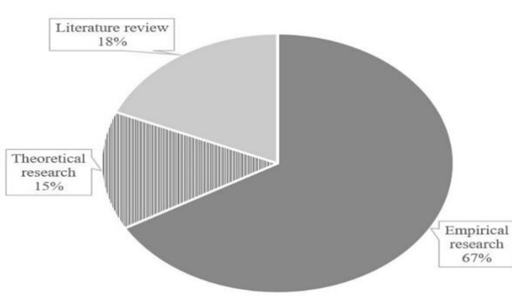

Fig. 2. RPA articles regarding the methodological approach

Appendix outlines the articles resulting from the SLR and the bibliographic results used to respond RQ1.

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B. SLR Results about RPA Definition and Understanding the Difference between RPA and BPM

To address RQ2-1, the preliminary literature review (Section 2.2) reveals inconsistencies in RPA definitions across the professional and academic literature. Some articles adopt a narrow view, defining RPA as the application of specific software and algorithms to automate repetitive manual tasks. Others expand the definition to encompass the integration of advanced digital technologies, such as AI (machine learning, image recognition), drones, and remote sensing technologies, into traditional RPA functionalities. This analysis aims to identify the various definitions of RPA, its characteristics, and functionalities as presented by researchers.

A majority of the definitions provided in the reviewed articles characterize traditional RPA as an emerging technology that automates repetitive human tasks, encompassing both digital and physical activities (e.g., [1, 7, 16, 18, 19, 30, 39]). Moreover, Geyer-Klingeberg et al. [17] and Leno et al. [29] underscore that these tasks are often prone to errors, making them well-suited for automation. Additionally, Aguirre and Rodriguez [1], Anagnoste [3], Gupta et al. [18], and Tsaih and Hsu [45] equate RPA with the utilization of cognitive technology, referring to it as cognitive automation. Gejke [16], Mendling et al. [33], and Penttinen et al. [37] emphasize that RPA is a software solution configured to interact with existing applications and systems in a manner akin to human interaction.

According to Issac et al. [22], functionalities of the traditional RPA are:

- Front office (attended) automation and back office (unattended) automation,
- Script based designer and visual process designer,
- The openness of the platform,
- Macro recorders for process mapping,
- Control through coding,
- Execution of automated test cases on remote machines,
- Bot development and core functions,
- The control room, system management, reporting and resilience, and RPA analytical potential.

In-depth content analysis of the selected articles reveals that Anagnoste [3], Kobayashi et al. [25], Kulbacki et al. [26], Lin et al. [31], Schmider et al. [41], Tsaih and Hsu [45], and Van Belkum et al. [47] explore the integration of RPA with emerging technologies. Notably, all seven articles were published in 2018. Table 2 summarizes these findings, shedding light on the potential impact of these technologies on the future development and implementation of RPA (RQ2-1).

Table 2. Traditional RPA and advanced digital technologies integration

Technology		Field of deployment	Ref.
AI	Machine learning	Healthcare (product development and life-cycle management of healthcare products)	[47]
		Healthcare (processing of adverse event reports)	[41]
		Tourism (tourist behavior prediction)	[45]
	Machine vision / image, screen, voice, pattern recognition	Sales (vendors' documentation processing)	[3]
		Semiconductor manufacturing (controlling the equipment and using screen image recognition)	[31]
	Natural language processing	Consulting (chatbots applied in the HR department)	[3]
		Tourism (chatbots used to provide one-stop-shop for travel information)	[45]
Drones and associated technologies		Agriculture (usage of drones, sophisticated, cameras, and RPA for agriculture automation)	[26]
Internet of Things (IoT)		Distribution, delivery (parcel delivery service using IoT, QR code recognition and RPA)	[25]

To address RQ2-2, which explores the distinctions between RPA and BPMSs, the content of the sampled articles was retrieved and analyzed. BPM is referenced in a total of 10 out of 27 articles. However, only six articles [1, 8, 27, 37, 43, 50] delve into the characteristics that differentiate RPA from BPMS, outline the steps involved in RPA implementation, and explain how RPA complements BPMS.

While BPMS communicates with business applications through APIs, RPA establishes connections between processes and applications by interacting with the user interface [9, 46]. According to Cewe et al. [8], "RPA can be considered a specialized form of BPMS that utilizes graphic user interface (GUI) automation adapters instead of conventional interfaces (i.e., application programming interfaces – APIs) for inter-system communication." BPMS development often requires advanced programming skills for hard-coding and integration with existing systems via APIs [1, 8]. Conversely, RPA development is significantly less time-consuming and cost-effective, and programming knowledge is generally not a prerequisite. The key conclusions drawn from these articles align with the RPA/BPMS preliminary overview presented in Section 2.3.

C. SLR Results: RPA in Business Practice

To address RQ3, which examines the utilization of RPA in business practice, the content of 12 case studies was further analyzed, focusing on the organization's industry type, the type or name of the process selected for automation, and the country of origin (Table 3). The findings indicate that two-thirds of RPA implementation projects reported by the researchers originate from two industries: services (7) and telecommunications (3). The remaining implementations are spread across finance and insurance (2), healthcare management (1), sales (1), and oil & gas (1) industries. Despite identifying human resource management, finance and accounting, and administrative back-office processes as prime candidates for automation, organizations have undertaken RPA initiatives in outsourcing services, sales, and purchasing processes. As shown in Table 3, RPA initiatives are predominantly spearheaded by organizations headquartered in developed countries such as Finland, the UK, and the USA, as well as by global companies.

Table 3. Implementation of RPA by industry type, process type and country

Industry type	Process type	Country	Ref.
Services	Recruitment (HRM services)	India	[18]
	Payroll process (outsourcing services)	Finland	[19]
	Financial process automation	Finland	[4]
	Payment receipt (outsourcing services)	Colombia	[1]
	Process of promotion in HRM (outsourcing services)	n/a	[2]
	HRM, IT management, Public relations, Knowledge management (consulting services)	n/a, global company	[3]
	HRM (audit, tax, and consulting services)	n/a, global company	[50]
Telecommunications	Purchasing	n/a, global company	[17]
	Sales (capacity check for bid processing) Subscription-based online service	Finland	[37]
	Back-office processes	UK	[27]
Financial and Insurance	Healthcare claims adjudication process	USA	[11]
	Administrative back-office process; Premiums processing; E-policies offshore process	n/a, global company	[50]
Healthcare management	Administrative, back-office processes	Finland	[39]
Sales	Vendor information processing	n/a, global company	[3]
Oil and Gas	Finance and accounting: the process of reconciliation the bank with the cash from the stations in the previous day	n/a	[2]

These findings suggest that a country's digital competitiveness and a high level of organizational ICT maturity positively influence RPA implementation. Additionally, the benefits of RPA implementation in business practice have been explored through an analysis of 12 case studies. The results reveal the following advantages of RPA adoption:

- Increased efficiency [1, 39],
- Reducing human labor, i.e. reducing workforce [39],
- Employees can concentrate on value creation [39],
- Costs savings [1, 17, 19, 37, 39],
- Ease of use [2, 19, 37],
- Increased volume of performed tasks [17, 39], and
- Increased quality of work, i.e. tasks are performed accurately, correctly and consistently [1, 17, 39].

V. DISCUSSION

This section delves into the analysis and discussion of the previously raised research questions. To address RQ1, a bibliometric analysis of a sample of articles was conducted, revealing that RPA research nearly tripled in 2018 compared to the 2016-2017 period. This suggests that the growth trend of RPA research is likely to continue in the future. Considering that RPA is a relatively new and emerging field, the results indicating the presence of 17 conference papers compared to 10 journal articles imply that the full research potential on RPA has not yet been realized. Therefore, it can be concluded that RPA studies are just beginning to emerge and are expected to proliferate in the coming years, including gaining prominence in peer-reviewed journals.

A significant portion (18 out of 27) of the analyzed articles fall under the "empirical research" category, indicating a scarcity of theoretical RPA research and conceptual frameworks. Our assumption about the lack of a systematic literature review (SLR) approach in the field was substantiated by the identification of only one structured literature study (e.g., an SLR article) examining RPA case studies. The top two conferences publishing RPA studies are both related to information systems (Lecture Notes in Business Information Processing Series) and IT and computing (ACM International Conference Proceeding Series). Similarly, half of the journal articles about RPA were published in journals covering the management of information systems issues (MIS Quarterly Executive) and case studies on contemporary information and communications technology themes (Journal of Information Technology Teaching Cases). Only three authors (Lacity, Willcocks, and Anagnoste) contributed more than one paper.

Addressing the first goal of RQ2-1, the analysis of RPA definitions reveals a consensus among researchers defining RPA as a "relatively new technology for process automation based on software and algorithms aiming to emulate human work and perform manual activities by interacting with information systems through existing user interfaces" [16, 33, 39]. From a business perspective, RPA is primarily used to "capture and interpret existing applications for processing a transaction, manipulating data, triggering responses, and communicating with other digital systems" [47]. Consequently, RPA is considered "suitable for high-volume, repetitive, monotonous, well-structured, and standardized tasks, where there is no need for subjective judgment, creativity, or interpretation skills" [1]. RPA solutions are minimally invasive, user-friendly, cost-effective, and relatively straightforward to implement, as they operate on top of existing information systems, do not store transactional data, and do not require a database [1, 19, 33, 50]. The analysis of RPA and advanced technologies integration sheds light on the future of RPA, addressing the second goal of RQ2-1. According to Anagnoste [3], RPA solutions are evolving towards AI technologies, incorporating features such as: "IOCR, chat-bots, machine learning, cognitive platforms, anomaly detection, pattern analysis, voice recognition, data classification, and many more". Furthermore, the implementation of "advanced RPA" across diverse fields (e.g., healthcare, tourism, agriculture, distribution, and sales) demonstrates the broad applicability of integrated RPA and advanced technologies.

An aspect we aim to explore in relation to RQ2-2 is the alignment of RPA research with the concept of BPM and its potential integration with BPMSs. Researchers concur that despite their differences, BPMS and RPA are complementary [1, 8, 46]. Therefore, the combined deployment of BPMS and RPA can facilitate digital transformation and enhance business performance.

The findings related to RQ3 highlight the benefits of RPA implementation across various industries, including banking and insurance services, healthcare and pharmaceuticals, and telecommunications [4, 27]. Business practitioners have identified several business functions as suitable candidates for RPA implementation, with sales, finance and accounting, and human resources management being the most frequently mentioned [43]. While early RPA adopters primarily focused on automating back-office tasks and internal support processes, such as accounting, billing, travel expenses, master data management, employee record management, and claims processing [1, 43, 49], recent research has documented the application of RPA to automate core business processes and shared service operations [40, 42]. According to Willcocks et al. [50], the expansion of RPA initiatives beyond back-office process automation to include business process outsourcing (BPO) service providers began in 2016.

The findings of the comprehensive analysis indicate that the perceived value of RPA is primarily associated with organizational performance improvements and cost reductions achieved through the reduction of human labor in routine business processes and the enhancement of work quality [23]. However, the benefits of RPA extend beyond directly measurable financial outcomes, encompassing aspects such as competence, market position, innovation, knowledge discovery, research, and development [34, 39]. Given that the costs of RPA development and maintenance can potentially exceed the realized savings, a thorough evaluation of business processes is crucial to determine their suitability for RPA implementation [7, 17].

VI. CONCLUSION

This paper presents the findings of a systematic literature review (SLR) on RPA, conducted using search results from the WoS and Scopus databases. To the authors' knowledge, this paper represents the first SLR focused on all RPA-related publications from the two named databases, making it a significant contribution to the field. The SLR revealed the existence of another RPA-related SLR; however, it was limited to case studies and did not encompass all available publications [51]. Additionally, the aforementioned SLR focused on publications accessible on the public web and Google Scholar.

Beyond its contribution to the literature, this paper delves into the opinions and writings of academics regarding RPA, exploring three research questions presented in the methodology section. In this context, the paper provides an overview of RPA definitions, usage, and benefits in practice, along with an explanation of the distinction between RPA and BPMS. Moreover, the SLR results indicate a scarcity of theoretical studies on RPA, suggesting that the field is still relatively new and that no theoretical frameworks have been established.

A limitation of this paper is the inability to access two papers identified through the search process, which were consequently excluded from the analysis. Based on the SLR findings, a research gap has been identified in terms of the lack of both theoretical and empirical research. Therefore, future research in this area should focus on bridging this gap. One potential direction for future research is to investigate both the direct and indirect impacts of RPA on organizational performance.

Appendix Articles resulting from the SLR

Ref	Year	Title of the paper	Col.		SS
			W	S	
[7]	2018	Towards a Process Analysis Approach to Adopt Robotic Process Automation		+	EA
[26]	2018	Survey of Drones for Agriculture Automation from Planting to Harvest		+	LR
[18]	2018	Automation in recruitment: a new frontier		+	EA
[31]	2018	Apply RPA (Robotic Process Automation) in Semiconductor Smart Manufacturing		+	EA
[39]	2018	Robotic process automation - Creating value by digitalizing work in the private healthcare?		+	EA
[47]	2018	Artificial intelligence in clinical development and regulatory affairs – Preparing for the future		+	LR
[33]	2018	How do machine learning, robotic process automation, and blockchains affect the human factor in business process management?		+	LR
[16]	2018	A new season in the risk landscape: Connecting the advancement in technology with changes in customer behaviour to enhance the way risk is measured and managed		+	TA
[17]	2018	Process mining and Robotic process automation: A perfect match		+	EA
[37]	2018	How to choose between robotic process automation and back-end system automation?		+	EA

[29]	2018	Multi-Perspective process model discovery for robotic process automation		+	LR
[30]	2018	Identifying candidate tasks for robotic process automation in textual process descriptions		+	TA
[41]	2018	Innovation in Pharmacovigilance: Use of Artificial Intelligence in Adverse Event Case Processing		+	EA
[45]	2018	Artificial intelligence in smart tourism: A conceptual framework		+	TA
[25]	2018	SNS Door Phone as Robotic Process Automation	+	+	EA
[22]	2018	Delineated Analysis of Robotic Process Automation Tools	+	+	EA
[51]	2018	The key factors affecting RPA-business alignment	+	+	LR
[8]	2018	Minimal effort requirements engineering for robotic process automation with test driven development and screen recording	+	+	TA
[19]	2018	How OpusCapita used internal RPA capabilities to offer services to clients	+	+	EA
[3]	2018	Robotic Automation Process - The operating system for the digital enterprise	+		EA
[50]	2017	Robotic process automation: Strategic transformation lever for global business services?		+	EA
[11]	2017	Resolving tussles in service automation deployments: Service automation at Blue Cross Blue Shield North Carolina (BCBSNC)		+	EA
[1]	2017	Automation of a business process using robotic process automation (RPA): A case study	+	+	EA
[43]	2017	Software bots -The next frontier for shared services and functional excellence		+	EA
[2]	2017	Robotic Automation Process - The next major revolution in terms of back office operations improvement	+		EA
[4]	2016	Turning robotic process automation into commercial success - Case OpusCapita		+	EA
[27]	2016	Robotic process automation at telefónica O2	+	+	EA

Note: Col. – Collection; W – WoS; S – Scopus; SS – Study strategy; EA – Empirical approach; TA – Theoretical approach; LR – Literature review

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