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KUHN's PARADIGM IN ACTION: IS ROBOTIC PROCESS AUTOMATION RESHAPING ACCOUNTING NORMS?

Dian Perwitasari[1,2]
Sri Iswati[1] (iswati@feb.unair.ac.id)

[1]Department of Accounting, Faculty of Economics and Business, Universitas Airlangga, Indonesia
[2]Accounting Study Program, Faculty of Economics and Business, Universitas Sebelas Maret, Indonesia

A B S T R A C T

The development of science causes a shift from the old to the new paradigm. With his term "scientific revolution", Kuhn proposed a more radical and revolutionary paradigm shift in science. This study aims to explore the relevance of RPA (and AI within it) from Kuhn's perspective, identify the opportunities and challenges of RPA according to the scientific community's perception, and RPA in the future for accounting firms. The method used in this research is descriptive-qualitative, which collects detailed data from various literature and semi-structured interviews. Our findings highlight that RPA becomes an inclusive and sustainable transformation tool with the right approach, providing broad economic and social benefits without compromising ethics. Policymakers should encourage collaboration between technology and the accounting profession. The presence of RPA is not a substitute for the accounting profession. There needs to be guidelines for using RPA balanced with establishing governance standards that emphasize the importance of accountability for the results processed by automated systems.
Keywords: *Scientific revolution; Kuhn's Paradigm; RPA; accounting profession, accounting firm.*

Perkembangan ilmu pengetahuan menyebabkan terjadinya pergeseran dari paradigma lama ke paradigma baru. Kuhn dengan istilahnya "revolusi ilmiah", mengemukakan pergeseran paradigma yang lebih radikal dan revolusioner tentang ilmu pengetahuan. Penelitian ini bertujuan untuk mengeksplorasi relevansi RPA (dan AI di dalamnya) melalui perspektif Kuhn, mengidentifikasi peluang dan tantangan RPA menurut persepsi komunitas ilmiah, dan RPA di masa depan bagi kantor akuntan. Metode yang digunakan dalam penelitian ini adalah deskriptif-kualitatif, yang mengumpulkan data rinci dari berbagai literatur dan melakukan wawancara semi-terstruktur. Temuan kami menyoroti, bahwa dengan pendekatan yang tepat, RPA menjadi alat transformasi yang inklusif dan berkelanjutan, memberikan manfaat ekonomi dan sosial yang luas tanpa mengorbankan etika. Para pembuat kebijakan harus mendorong kolaborasi antara teknologi dan profesi akuntansi. Kehadiran RPA bukanlah pengganti profesi akuntan. Perlu ada pedoman penggunaan RPA yang diimbangi dengan penetapan standar tata kelola yang menekankan pentingnya akuntabilitas atas hasil yang diproses oleh sistem otomatis.
Kata kunci: *Scientific revolution*; Paradigma Kuhn; RPA; profesi akuntansi.

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INTRODUCTION

The development of science is increasingly changing, and without realizing it, the current human paradigm is different from the previous paradigm (Diamastuti, 2015). In the contemporary era, science has experienced significant progress, resulting in many discoveries regarding various scientific and natural truths (Nurkhalis, 2012; Putri et al., 2020). The idea of revolutionary science was first put forward by Thomas S. Kuhn (1962) using the term "scientific revolution", which guarantees that the scientific paradigm will continue to develop significantly and revolutionarily. When the paradigm changes from the old paradigm to the new one, partially or entirely, science is experiencing a radical and revolutionary shift. This paradigm shift will bring about an extensive development of science (Farid, 2021). Therefore, Thomas Kuhn is included in the category of rationalist philosophy of science in the contemporary philosophical

school (Digarizki & Anang, 2020).

Kuhn criticized the positivist perspective of Auguste Comte and the falsification of Karl R. Popper. The positivist view argues that science's continuous development results from empirical findings based on the principle of verification. However, this contrasts with Popper, who denies the verification principle and states that science develops based on falsification, an effort to prove that an existing theory, hypothesis, or proposition is incorrect (Farid, 2021). Changes in science are marked by theories that fall through the process of proof that the theory is wrong or irrelevant to the conditions at that time. Furthermore, Kuhn's idea emerged that the two views did not necessarily influence scientific changes and developments. Kuhn argued that the scientific revolution approach, namely the progress of science, leads to a more revolutionary paradigm change. From this explanation, the terms "paradigm" and " scientific revolution " developed into terms commonly associated with Kuhn's thinking.

Rapid technological advances continue to reshape the accounting and auditing professions. Emotional intelligence, critical thinking design, advanced problem-solving abilities, and collaborative and communication skills will be essential as new technologies can mirror human behavior faster and more accurately than humans (Alsharari, 2017; Matthies, 2020). The emergence of new technologies is changing how companies process information. The current research focuses on deploying robotic process automation (RPA) and the skills accountants need to interact with RPA. In-depth case studies have been conducted on RPA implementation from start to finish to ensure the success of RPA implementation (Cooper et al., 2019; Kokina et al., 2021).

Through various procedural steps and binding rules, the accounting process is not too complex to automate (Moffitt et al., 2018; Otia & Bracci, 2022). Simultaneously, this automated procedure can produce audit logs that can provide more detail than manual audit logs. Accounting standards and rules are susceptible to change (e.g., tax laws). Robots can remember to follow the rules set. RPA is a significant alternative for organizations to replace outdated systems, which is currently impossible for traditional automation options. (Goodel et al., 2021) argue that RPA creates new accounting roles while eliminating others (especially entry-level). Accountants can focus on professional choices, interpreting financial data, and contextualizing across the supply chain organization. The accountant will set standards, prepare annual reports, include input into business strategy, and guide the RPA transition (Harrast, 2020; Plattfaut & Borghoff, 2022). To maintain their competitive edge over robotic personnel, accountants must master skills that robots are less likely to learn.

However, some of the problems from the accounting profession's perspective related to the rapid development of technology today are concerns that RPA will shift a lot and even eliminate the accounting profession (for example, at the entry-level). A paradigm shift is inevitable, where the conventional paradigm shifts to a modern one. As the use of RPA in accounting studies and professions matures and expands, this field of research will develop and change the audit and accounting profession (BarrPulliam et al., 2022; Vincent et al., 2020). Accounting professional associations must adapt quickly to educate future accountants about this knowledge, which will likely drive radical changes in professional organizations. (Chon, 2017) stated that the existence of robots should not shift the role of accountants if they have specific skills, such as advisors, analysts, or handling exceptional cases in the audit process. On the contrary, robots are programmed technology, unlike humans, who can be relied on to handle unique cases requiring a personal approach.

Previous studies have reviewed Thomas Kuhn's paradigm in various scientific fields. However, the rapid development of information technology has caused a paradigm shift from the traditional paradigm to a more automated

modern paradigm. The author observes that this may be related to the scientific revolution paradigm developed by Thomas Kuhn. Based on the research problems, we review how RPA shows a paradigm shift in how data is processed and managed in accounting regarding the scientific revolution resulting from Kuhn's thinking.

This study is designed to answer three main questions. First, is the phenomenon of the emergence of RPA in the accounting profession relevant to the paradigm of the theory of revolution proposed by Kuhn? Second, is RPA a challenge or opportunity for the accounting profession from the perspective of the scientific community? Third, How will RPA affect accounting firms in the future?

In addition, this paper is organized as follows. The first section, we discusses the background of the paradigm shift in science according to Thomas S. Kuhn and the emergence of Robotic Process Automation (RPA) in the accounting profession. The second section, reviews the concepts of paradigm and scientific revolution in the philosophy of science and the application of RPA in accounting. The third section explains the descriptive-qualitative research method based on literature review used in this study. In discussion section, we explores the relevance of the RPA phenomenon to paradigm revolution theory, the scientific community's views on RPA as an opportunity or threat to the accounting profession, and its application in future accounting firm. The article concludes with conclusions and recommendations regarding the impact of RPA on the transformation of the accounting profession.

LITERATURE REVIEW

Kuhn Paradigm

In Kuhn's epistemology, the term "paradigm" is significant because he argued that science develops revolutionarily, where a new, very different paradigm completely replaces the old paradigm. To prove this, Kuhn illustrated the cycle of science, internally called the "paradigm", the scientific community, and the scientific revolution. In his book entitled The Structure of Scientific Revolution, Kuhn (1962) stated:

> "By selecting them, I mean to suggest that some examples of actual accepted scientific practice—examples that include laws, theories, applications, and instrumentation—provide models from which a certain coherent tradition of scientific research emerges."

Based on the quote, Kuhn argues that the definition of a paradigm is a system of beliefs and values that are mutually agreed upon in a scientific community (Ritzer, 2004; Anand, et al., 2020). Often, accepting a new paradigm requires rediscovering their respective scientific perspectives. So that their acceptance remains relative based on the level of belief and intellectual taste of each group of scientists or scientists (Hasbullah, 2000; Anand et al., 2020). In forming a paradigm, an investigative approach may be needed from the starting point of an object to the narrowing of the point of view, the formulation of theories, and the simple reflections they find. Ultimately, the entire system of beliefs, values, and techniques used by the scientific community is considered a paradigm they agree on (Nurkhalis, 2012; Putri et al., 2020).

According to Kuhn, a scientific paradigm is a theoretical framework on how to view and understand science by a group of scientists as a way of viewing the world (worldview). As a result, the paradigm forms a common consensus among certain scientists and has different characteristics or patterns between one scientific community and another. Scientists describe the paradigm as their lens in observing and researching scientific issues in their respective fields and trying to find answers. (Paton, 1940) defines the concept of paradigm to provide clarity to Kuhn's paradigm theory, namely:

> "A paradigm is a worldview, a general perspective, a way of breaking down the complexity of the real world. As such, paradigms are deeply embedded in the socialization of adherents and practitioners: they tell

> them what is important, legitimate, and reasonable. They are also normative, telling practitioners what to do without the need for lengthy existential or epistemological deliberation. But it is this aspect of the paradigm that constitutes both its strength and its weakness—its strength in that it enables action, its weakness in that the reasons for that action are hidden in the paradigm's unquestioned assumptions."

Kuhn (1962) explained science's paradigm shift, which is suspected as a scientific revolution. Although Burell and Morgan do not explicitly mention Kuhn's ideas in the context of their four paradigms, historians have interpreted and seen that Kuhn's ideas that focus on paradigm shifts are more in line with the radical structuralist paradigm because of the pressure of revolutionary change in social structures. Both recognize that radical change or "revolution" can occur in social and scientific contexts. Although Kuhn's concept of "paradigm" focuses more on the philosophy of science, the idea of revolution and profound structural change aligns it with the Radical Structuralist Paradigm.

The scientific revolution approach is considered a significant transformation in the development phase of science. The new paradigm will undoubtedly replace the old paradigm. Sometimes, some scientists or the public do not want to accept the new paradigm, so the emergence of the scientific revolution is still challenging to accept quickly. This raises the problem of the legitimacy of a more apparent paradigm (Almas, 2018). The extent to which scientists and the public accept a new paradigm will determine the extent to which the scientific revolution occurs. Suppose one or a few scientists refuse to accept the new paradigm and stick to the old one that was previously broken and does not get support from most scientists. In that case, their research activities will be tautological and completely useless.

Robotic Process Automation

The term "Robotic Process Automation" (RPA) refers to a collection of general automated tools for automating manual and repetitive activities at scale, for example, automating manual operations performed on spreadsheets, in-house, legacy programs, or other systems (Bendovschi & Ionescu, 2015). Applying for an RPA in accounting and finance should not replace humans; with RPA, humans can concentrate on strategic activities. High-level accounting is challenging and requires in-depth knowledge when analyzing financial records, checking financial statements, or calculating corporate taxes. RPA can complete clerical work quickly, so it can be said that RPA improves accounting work. Accountants can focus more on being more analytical and forward -thinking while continuing to improve RPA capabilities, driving continuous progress (Chan et al., 2018).

RPA, a technology-based process improvement technique, is anticipated to be used in auditing to replace time-consuming human tasks and drive audit process reengineering (Brás et al., 2024). Public accounting firms can use the implementation of RPA to assess whether RPA is suitable for use (Bahrin et al., 2016). Balamurugan et al. (2022) mentioned three main stages of RPA implementation: 1) Process understanding, 2) Data standardization for audit, and 3) Automated audit test execution. It is said that RPA excels in performing discrete, straightforward work and high-volume operations that often require minimal human supervision, such as processing invoices, entering sales orders, handling refunds, and automating customer service responses. Figure 1 summarizes the significant benefits of RPA implementation.

RPA is an attractive technology for many businesses. Many accounting, financial, and audit procedures can be partially or fully automated to speed up work. Automation can negatively impact staff morale and process errors (Cooper et al., 2019). However, if RPA is successfully implemented, it will offer many benefits. Regarding financial planning and forecasting, planning cannot be considered credible without the correct data. The actual business data serves as a blueprint later compared with the existing budget to determine financial projections. Modern

accounting systems help companies adapt to current market conditions, where forecasting factors change rapidly. However, in a conventional environment, finance often spends most of its time struggling with manual methods and spreadsheet-based methods to get the correct numbers. EY claims that because finance teams primarily focused on financial closing, companies must wait until the period's end to get information.

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The accounting process is a predetermined procedural activity that is relatively easy to automate. Changes from time to time to the rules that are always associated with the accounting process, such as tax laws, require accountants to be able to adjust to these rules quickly. Robots can be reprogrammed to comply with new regulations quickly (Williams & Allen, 2017). In other words, RPA helps reduce human error while increasing the effectiveness of business processes. Although RPA can communicate with other software programs at the user interface level, RPA does not have the intelligence to make complex judgments. RPA includes robotic technology, Artificial Intelligence (AI), machine learning, autonomous systems, and more (Appelbaum et al., 2017). RPA primarily accesses and works with spreadsheets, documents, and emails that utilize programs within the company to perform tasks. RPA makes automating ongoing tasks and procedures easy across multiple departments, including those responsible for manufacturing, finance and accounting, sales, acquisitions, supply chain management, customer support, and human resources

The audit process has evolved to include several tools and procedures, often associated with several human steps and verification "clicks." Entire predetermined sequences of automatable operations can be accomplished using RPA. RPA can automate specific steps in the audit process, particularly those that involve strategy and judgment (Asquith & Horsman, 2019).

RPA is a significant and disruptive change from the manual audit practices currently used, but it also has the potential to enable auditors to perform at a much higher level (Moffitt et al., 2018). As a result, some accounting firms have adopted RPA to automate their repetitive tasks (Moffit et al., 2018) and have witnessed firsthand the efficiency benefits of implementing RPA (Cooper et al., 2019). Research conducted by Perdana et al., (2023) describes actual business process scenarios from a broader spectrum related to the implementation of RPA in audit

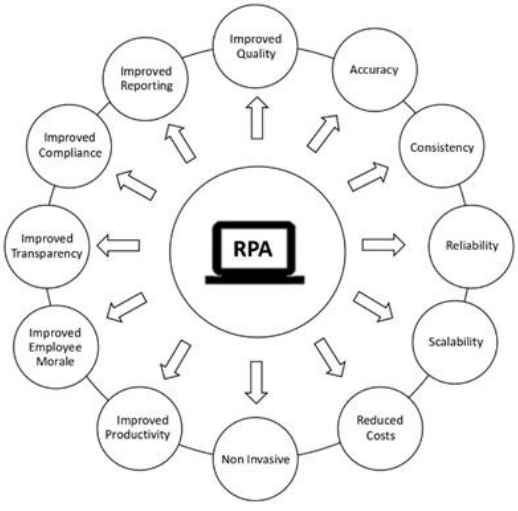


Figure 1.
Benefits of RPA (Balamurugan et al., 2022)

practice. These scenarios include: (1) an employee loan audit scenario; (2) a bank reconciliation review, analytical procedures, and three-way match scenario; (3) a search for unrecorded liabilities scenario; and (4) an audit of statutory records. Thus, it can be confirmed that RPA will automatically create new roles for accountants and auditors and also lead to the elimination of other positions (e.g., entry-level roles) (Moffit et al., 2018).

RESEARCH METHODS

The method used in this research is a descriptive-qualitative research method based on previous research findings, analyzed, and then systematically presented in-depth conclusions (Creswell 2014). The approach used is qualitative, which serves as a key instrument using data collection techniques through data triangulation. Data collection from literature studies and semi-structured interviews. This study summarized data following previous research (Richardsson and Dull 2016, Dagiliene and Kloviene 2019, Kokina Julia and Blanchette Shay 2019). We conducted semi-structured interviews to reflect on their professional experiences. The interviews were conducted to see the perspectives of academic and professional regarding the current paradigm shift in science marked by the emergence of RPA adoption and its impact on the accounting profession. These perceptions cannot be measured, so they must be explained with descriptions based on the abilities and specializations accountants possess as informants. Academic informant are selected based on lecturer with at least 10 years of experience to learn more about the competencies required for RPA implementation. Meanwhile, professional informant are based on auditor with more than seven years of work experience to see the practical effect of RPA implementation on the accounting profession; this aims to see the different perspectives of each informant. We protect the confidentiality of informant data and examine each perspective independently. Moreover, the outcomes of interviews with informants have been analyzed into information that may be broadly provided in this article.

ANALYSIS AND DISCUSSION

The relevance of the RPA in the accounting profession and Kuhn Paradigm

Robotic Process Automation (RPA) technology is developing rapidly and has influenced changes in the field of accounting. By eliminating work that has been done by humans repeatedly, this technology can increase operational efficiency in the field of accounting (Hofmann et al. 2020). The changes that are currently occurring are quite interesting because they relate to Kuhn's view of the scientific revolution. For example, RPA and other technological advances can cause a paradigm shift in the field of accounting, creating new jobs that require critical thinking and strategic development (Kesuma and Hidayat 2020).

Robotic Process Automation (RPA) emerged as a solution in the early 2000s when companies wanted to cut costthe s and work more efficiently. RPA technology comes from combining software automation with basic AI, which allows software (called “robots” or “bots”) to perform human-like tasks on a user interface. At its nascent stage, this technology can assist with basic and repetitive activities such as data entry, document management, and information updates across several systems. RPA technology in industrial development enables organizations to alleviate personnel from repetitive duties, allowing them to focus on work requiring advanced cognitive skills and decision-making (Syed et al. 2020, Solekah 2024).

Traditional systems such as Business Process Management Systems (BPMS) and Workflow Automation already recognized the automation concept at that time. But RPA, unlike BPMS, does not require structural customization or deeper integration. It was easy to implement RPA. Existing systems do not need to be changed. RPA only requires access to a user interface, taking over specific steps handled by an employee. The main reason RPA is getting so much attention is that it

can be implemented quickly and economically without changes to the existing IT infrastructure (Ayinla et al. 2024).

In recent years, there has been a tremendous development in artificial intelligence, which, in the long run, can completely change the business process automation scene and the choice of processes to be automated using RPA. For unstructured data or amorphous processes—where the robot has no inherent logic for guidance—such procedures can be particularly relevant (Willcocks et al., 2015). RPA is currently still mostly used for front-office tasks, including customer support so it can assist in back-office or operational activities. Consumers can also interact with bots built on artificial intelligence to ask basic questions or make routine requests without human interaction (Daase et al. 2020). The emergence of new business processes has expanded the influence of RPA in the digital revolution of companies. Many business operations are seeking to use and leverage RPA to add value across their operations (Sobczak 2022). Because this technology increases output and reduces human error, many companies are interested in using RPA (Madakam et al. 2019). Technological advances in the 2010s resulted in the combination of RPA with AI and the power of machine learning that allows bots to recognize complex data and make basic decisions based on analyzed data trends (Ribeiro et al. 2021, Abdullah and Almaqtari 2024). Rapid development from automating manual processes to smarter and more flexible technologies, this technological revolution has significantly advanced RPA. However, the most important thing in implementation is that the coordination of tasks within the RPA management team must be clearly defined, and each member must receive training appropriate to their position so that everything can run smoothly. These operational tasks include management, testing, system support, process facilitation, and product support.

According to Kuhn's paradigm, a paradigm shift is an evolutionary process in which a new paradigm emerges and replaces the old paradigm, where the new paradigm will be more appropriate to its times (Kesuma & Hidayat, 2020). (Kesuma and Hidayat 2020). In the accounting field, the traditional paradigm characterized by manual and repetitive work methods is slowly being replaced by the emergence of a new paradigm where the new paradigm emphasizes the use of technology in automating procedures. RPA significantly facilitates this transformation by allowing accountants to delegate administrative work and concentrate on more complex and strategic analysis (Kroon et al. 2021). This is also in line with Bill Gates' thoughts as quoted from the study (Stefan et al., 2018):

> *"The primary principle of technology utilized in business is that automation implemented in efficient processes would enhance efficiency. The additional principle is that automation implemented in inefficient activities would exacerbate efficiency"*

Various benefits such as efficiency, accuracy, and consistency in data processing will be obtained with RPA. Robotic Process Automation (RPA) has been used in many industries, including accounting; it can reduce some workloads, especially in repetitive manual processes. RPA allows accounting practices to simplify data entry, financial reconciliation, financial reporting, and many operational processes. In this way, accountants will shift to more analytical activities in upper-level decision-making because they are assisted in performing operational tasks (Hofmann et al. 2020). However, additional problems arise, especially related to capability alignment. Because RPA has accounting-related components and involves software and data management, accountants need to develop new skills related to managing and analyzing data generated by technology (Kroon et al. 2021)

Kuhn argues that a paradigm revolution occurs when the prevailing paradigm fails to account for or address abnormalities in current practices or theories. A new paradigm will supplant the

previous one, steering the field in a more pertinent path (Kesuma and Hidayat 2020). RPA is an anomaly that triggers a transformation in the accounting profession. In the past, accountants performed mostly manual work. However, with the existence of RPA, automation in accounting sets a new paradigm that has reorganized the old working method as a whole. For accountants, this new paradigm portrays them more as researchers and data analysts rather than just data recorders and processors. Thus, the paradigm shift in accounting makes a change in focus from operational tasks to more strategic and technology-based tasks (Kesuma and Hidayat 2020).

The part of accountants today in its evolution is expected not just as "record keepers" but also as "insight providers". Job automation using RPA can take the place of more manual accounting duties. This kind of change makes the reality now that accountants also have to be knowledgeable data analysts and grasp information technology thoroughly so they can assist the business decision-making of the organization (Kroon et al. 2021). RPA's evolution in the accounting sector is driving it toward a technological emphasis and strategic framework that gives ever-increasing possibility priority over simple data processing. This shows that Kuhn's Paradigm of paradigm changes is relevant in this context.

Kuhn further argues that a paradigm shift is a leap, not a linear process, that radically restructures the science or discipline concerned. Under these circumstances, the application of RPA by the accounting profession can be considered as part of a "leap" towards a new paradigm with technological accounting capabilities and awareness of data analysis and automation. Impacted by RPA, this new paradigm presents accountants as strategic decision-makers and data analysts who help to realise company goals by means of excellent technology knowledge (Kroon et al. 2021). This shift requires accountants to upgrade skills that were previously absent or not in their line of work. The new paradigm in RPA implementation requires an understanding of digital technology, data management, and information analysis. According to Kuhn's theory, changing a new paradigm requires adaptation to tools or approaches that have never been used before, thus motivating the accounting profession to follow a path that is more technology and innovation-oriented (Almas 2018).

Furthermore, the revolution in accounting depends mostly on the automation of extensively applied robotic procedures. Kuhn claims that the paradigm replaced by automation demonstrates the obsolescence of the traditional approach in modern times. Following this concept, RPA and other automation tools are enhancing results and redefining the function of accountants as strategic partners in corporate decision-making. RPA has thus changed the new role of an accountant by prioritising data and business strategy more than simple record-keeping or administrative operations (Mulawarman 2010, Hofmann et al. 2020, Kesuma and Hidayat 2020). From Kuhn's perspective, RPA constitutes a new chapter in the development of the accounting profession since it demonstrates how technological innovation can substitute contemporary paradigms.

From Kuhn's perspective, the emergence of artificial intelligence in the last decade has highlighted the emergence of a revolutionary paradigm in various industrial sectors. AI converts as a computational program of human intelligence feasibility that can help make decisions, solve problems, and develop predictions (Vedapradha et al. 2019, Manongga et al. 2022). AI is a paradigm catalyst for revolution, relevant to Kuhn's theory. This is because AI drives a shift from the old paradigm to a new paradigm triggered by an anomaly. In the context of traditional accounting, the limitations of manual and the potential for human error are anomalies that cannot be resolved with the conventional accounting approach. AI is present to overcome this anomaly and the existing paradigm shift.

Scientific Community Perspectives on Robotic Process Automation (RPA): Opportunity and Challenge

Since its emergence, Robotic Process Automation (RPA) has been discussed in many scientific communities. Many researchers have studied this topic, so the research topic on RPA was trending with a score of 25/100 in March 2017, then increased to 100 in September 2018, which also showed the peak of the term's popularity. (Syed et al. 2020). The statement regarding the popularity of the term is increasingly valid when (Kokina Julia and Blanchette Shay 2019), in his research it states that in 2021, the Robotic Process Automation market grew by $2.9 billion from in 2016, which was only around $250 million.

Academic literature on RPA has increased significantly in recent years, reflecting the growing interest in this technology. Many researchers consider RPA the first step to more sophisticated automation, such as integrating AI and machine learning (Van der Aalst et al. 2018). However, the main focus of RPA remains on automating manual, rule-based tasks, such as data processing, document processing, and logistics management (Madakam et al. 2019). Applied in several fields, including banking, healthcare, education, and manufacturing, this technology has produced various results depending on the context and readiness of the company (Bhatnagar and Jain 2019). RPA applied in the business line has produced different points of view from many experts, including the scientific community. Consequently, the discussion on RPA has become among the most widely studied topics.

Early implementation of Robotic Process Automation (RPA) in enterprise automation systems has yielded significant benefits and the potential to improve business performance, according to numerous studies. This speculation is based on the significant benefits this technology offers in improving efficiency, accuracy, and speed of operations in many industrial sectors (Lacity and Willcocks 2016, Aguirre and Rodriguez 2017). This development is among the most significant technologies influencing digital transformation. RPA is an attractive solution option for companies with limited resources or complex systems because it can be implemented without changing much of the current IT infrastructure unlike more complex automation technologies (Willcocks et al. 2015).

The scientific community views Robotic Process Automation (RPA) as a way to improve operational efficiency and reduce reliance on human labour. RPA has been implemented in various industry sectors; for example, in the financial industry, RPA is used to speed up audit and risk control processes (Lacity and Willcocks 2016). However, in this excitement, questions also arise. The scientific community largely discusses the financial and social impacts of replacing human labour (Van der Aalst et al. 2018). The scientific community's perspectives on the possibilities and challenges of RPA implementation from several angles—including economic, social, technical, and ethical—will be discussed in this paper. Thus, this paper will discuss the study of RPA from various perspectives.

Economically, one of the main opportunities recognized by the scientific community is cost-effectiveness. Using RPA can help businesses save up to thirty per cent in operational costs, according to several studies (Willcocks et al. 2015, Everest Group 2020). After using RPA for automated handling, for example, a North American insurance company claimed annual savings of $5 million (Lacity & Willcocks, 2016). These savings come from reduced human labour demand and increased process accuracy and time economy. RPA also results in better time effectiveness. Especially for routine administrative tasks such as data entry or document management, work that used to take hours can now be completed in minutes (Aguirre and Rodriguez 2017). RPA accelerates financial industry transactions including loan reservations, insurance claims, and other banking. As a result, companies can immediately satisfy customers and provide services to them

quickly (Willcocks et al., 2015 ; Bhatnagar & Jain, 2019). Processing more work in less time helps businesses to increase their operational capacity without adding human resources (Van der Aalst et al. 2018). Thus, RPA helps businesses to address the challenges of increasing work volumes. Although implemented in many industry sectors, RPA can integrate the latest technology with legacy systems without requiring significant infrastructure expenditure (Bhatnagar and Jain 2019). This keeps companies competitive through digital transformation. Another potential benefit comes from RPA's ability to help Micro, Small, and Medium Enterprises (MSMEs) in rapid expansion. With operational savings and relatively modest implementation costs, MSMEs can challenge large enterprises (Van der Aalst et al. 2018). In addition to financial savings, RPA helps businesses to improve performance significantly.

Socially speaking, RPA is also considered as a means to reduce the amount of human labour needed for boring, repeating tasks. This lets employees concentrate on more strategic and creative projects (Madakam et al. 2019). For example, RPA has been used in healthcare to automate administrative processes such as patient registration, insurance claim processing, and doctor schedule management. Thus, medical personnel can focus more on patient care (Everest Group 2020). For example, a hospital in India reported a 40% increase in efficiency after implementing RPA for operation management schedules (Bhatnagar and Jain 2019). RPA enables more efficient student data management in education so educators can interact more directly with students (Bhatnagar and Jain 2019). In addition, RPA creates opportunities for new jobs. The scientific community notes that the increasing need for RPA managers and developers can create new jobs in the technology sector (Lacity and Willcocks 2016). With the increasing demand for RPA managers and developers, many technology companies offer training and certification for these skills (Madakam et al. 2019). This will allow those with programming, data analysis, and business process management skills to gain new jobs. While these social opportunities are significant, they still depend on the ability of individuals and organizations to adapt to the changes brought about by the technology of their time (Aguirre and Rodriguez 2017).

However, despite these good opportunities, the scientific community also warns that new challenges arise in implementing RPA. They acknowledge that the implementation of RPA will cause some jobs to be eliminated in the future, most likely manual and repetitive jobs (Lund et al., 2021; Van der Aalst et al., 2018). Adopting RPA is one of today's biggest social challenges (Lund et al., 2021). According to several studies, automation could threaten up to 800 million jobs globally by 2030. Administration, manufacturing, and logistics are the three industries that will be most affected (Van der Aalst et al. 2018). In addition, the skills gap also presents another obstacle. Many employees displaced by RPA cannot move to other, more technical jobs (Madakam et al. 2019). Given the lack of knowledge and limited access to technology training, resistance to RPA is sometimes more significant in developing countries (Bhatnagar and Jain 2019). This slows down the adoption of the technology and results in an economic gap between developed and underdeveloped countries. Policymakers must prioritize these social issues, especially those related to job transition and the design of retraining programs (Everest Group 2020).

In addition to capability, the main barrier to RPA adoption is a reluctance to change. Research shows automated technology can sometimes impact employees, especially if they feel left out of the company's digital transformation (Aguirre and Rodriguez 2017). Some keys to reducing resistance to automation include more open communication and increasing active employee involvement. The scientific community has also found psychological impacts of automated technology. According to them, the presence of RPA technology can sometimes

cause workers to experience anxiety, stress, and even depression about their future because their jobs are replaced by automation (Everest Group 2020). Therefore, companies must also ensure that the implementation of RPA is efficient but still maintains employee well-being.

In a technical sense, RPA finds it difficult to fit with old systems. Many businesses lack IT systems appropriate for current technologies (Willcocks et al. 2015). Furthermore, RPA is only beneficial for rule -based tasks. Jobs requiring complex analysis or decision-making are increasingly relevant to artificial intelligence or machine learning (Van der Aalst et al. 2018). The research community notes that often, the lack of knowledge of managerial and staff technical drives RPA implementation challenges (Madakam et al. 2019). This emphasizes the need for comprehensive training. In addition, data security issues remain another technical challenge. Direct RPA access to corporate systems raises very serious concerns about data leakage (Aguirre and Rodriguez 2017). The scientific community suggests strategies to address this challenge, including gradually modernizing IT infrastructure and aggressively controlling security issues (Everest Group 2020).

Apart from technological and social issues, the RPA begs moral ones. One of the major concerns is how businesses should make sure that job losses do not aggravate social inequality (Lacity and Willcocks 2016). The scientific community argues that the use of RPA should be accompanied by policies that combine social welfare and economic efficiency. In terms of consequences, businesses can allocate some of the funds set aside for staff development for additional objectives (Lund et al. 2021). Furthermore, needed are well-defined policies for using RPA, especially in sensitive industries like banking and healthcare (Bhatnagar & Jain, 2019). These rules should make sure that using RPA does not compromise data security or privacy.

Several academic studies often argue about corporate social responsibility in the automation paradigm. In this context, in addition to businesses having to seek financial effectiveness, they also have to consider the social and environmental issues of the technology they implement (Madakam et al. 2019). This includes electronic waste generated by hardware implemented in automation. If governments, businesses, and educational institutions work together, then sustainable RPA implementation is expected to be more effective. The scheme is that governments can offer incentives and rewards for business organizations that support and encourage inclusive digital conversion. At the same time, universities can help by offering relevant technology automation training programs (Van der Aalst et al., 2018).

RPA and its future in accounting firm

The audit field is one of the fields in accounting that most needs rapid implementation of Robotic Process Automation (RPA). In the audit process related to data import and export and producing a faster process, this technology will minimize the possibility of errors and produce good quality data so that the devices in RPA will greatly assist the process (Alvindi et al. 2022). RPA also enables more complex audit procedures, including real-time automatic data measurement. Ultimately, this will increase the accuracy and efficiency of the audit process (Zhang et al. 2022).

Although these benefits are numerous, applying robotic process automation (RPA) inside the audit scope also raises challenges. First, RPA calls for a significant cost allocation, particularly in situations when automated systems call for consistent updates and changes (Kokina Julia and Blanchette Shay 2019, Syed et al. 2020). If the system has to be altered to fit changes in corporate policy or business process procedures, high-cost expenditure can become a serious concern. In addition, sometimes challenging maintenance processes include technical issues from RPA software, inadequate IT infrastructure, and automation scripts (Asatiani & Penttinen, 2016; Lacity & Willcocks, 2016). Automated scripts must always follow

changes in internal company policies. In addition, inadequate IT infrastructure can be a constraint on RPA performance. Thus, continuous technological advancement is essential.

The second challenge is still related to RPA maintenance, especially data security. Especially considering that the audit field usually handles confidential clients, the loss of confidential data due to system failure or cyberattack can damage the company's reputation (Huang and Vasarhelyi 2019, Syed et al. 2020). Therefore, RPA maintenance by improving the data security system to reduce the possibility of information leakage is very important, and maintenance is not limited to technical issues. In addition, RPA maintenance costs also include employee training and technology upgrades intended to ensure the system functions properly (Aguirre and Rodriguez 2017, Asatiani et al. 2019). Budget planning is crucial for companies to manage change without sacrificing productivity and efficiency. Inappropriate budget allocation results in a difference between the initial objectives of implementing RPA so that business processes are hampered.

One of the biggest challenges is ensuring the sustainability of RPA, which will largely depend on the success of employee training in understanding and applying their abilities to maximize the features of the existing technology. In addition, this technology also needs to be adapted quickly, especially in areas where regulations and operating guidelines often change (Asatiani and Penttinen 2016, Willcocks et al. 2019). Auditing is an area that is directly correlated with tax provisions and related laws and is therefore susceptible to change, so it is one of the areas that typically experience frequent regulatory changes. Investing in staff training can help ensure that staff members can work effectively with modern technology. In addition, the success of RPA applications depends on the cooperation between users and the development department. To know the needs and challenges of the user department, the RPA development department should actively interact with them. Users should also provide useful criticism, allowing businesses to design systems that are adaptable and responsive to transformation.

Holistic strategies such as improving IT infrastructure, financial planning, and staff training together can help ensure proper RPA migration (Lacity and Willcocks 2016, Huang and Vasarhelyi 2019, Kokina Julia and Blanchette Shay 2019). In the long run, the involvement of regulators and technology providers will be essential in the transformation process. Strengthening technical assistance, implementation guidelines, and data security needs can help companies in general adopt RPA without facing significant risks (Aguirre and Rodriguez 2017, Asatiani et al. 2019). Thus, RPA can be a cornerstone of digital transformation in the accounting sector.

Robotic Process Automation (RPA) has proven to be an advantage for businesses that use it, especially with accounting and auditing, although there are still challenges in its implementation. RPA does have bright prospects in the future, if carried out sustainably. With the various benefits provided, RPA can provide time savings as its main advantage. Time-consuming audit procedures and repetitive processes can be helped by automation and free up auditors to concentrate on more strategic and analytical tasks. Companies that use RPA can save 30–50% on some jobs, thereby increasing their long-term efficiency, according to research conducted by Willcocks et al., (2019). In the audit process, where time is of the essence, this time efficiency will be very useful. In addition, RPA users also show a marked increase in operational efficiency, according to research Westerman & McFarlan, (2020). Their research revealed that the time to complete a process in a company's operations will be 50% faster than a few years ago after automation. Through this automation, staff members can concentrate on more value-added activities such as data analysis and decision-making rather than on mundane tasks.

Apart from cost savings and

efficiency, the implementation of RPA can help improve compliance with relevant regulations as well as the level of data accuracy. In its implementation, for example, RPA can assist in the audit process by reducing human errors that usually occur at the data matching or tax calculation stages (Smith and Adams 2018). Through this automation, processes also become more constant and can be monitored in real-time, reducing the likelihood of related legal violations. In the audit profession, this is especially important as small errors can have large legal repercussions.

RPA implementation is increasingly becoming a special concern in many accounting and auditing firms as a necessary first step towards broader digitalization. Based on an analytical study conducted by Babu & Kumar (2020) shows that there is an increase in productivity and a decrease in operational costs from the widespread implementation of RPA in the accounting sector, which can provide long-term benefits. Companies that want to implement RPA effectively must have a good, well-defined strategic plan and guarantee appropriate training for all personnel involved. The success rate of RPA will depend on the company's ability to adapt to current systems and incorporate new technologies into them.

CONCLUSION

From the analysis explained in this article, it is clear that RPA Implementation offers many benefits and great challenges. Economically, adopting RPA allows companies to increase production output, cost-effectiveness, and competitiveness. If implemented with the right strategy, RPA implementation can be an instrument for inclusive technological development, generating broad social and economic benefits without compromising ethics and community well-being. Therefore, the role of the scientific community is crucial in providing empirical knowledge and education to help companies and governments overcome problems and obstacles in the implementation process. In the long run, the scientific community argues that working with governments, companies, and educational institutions will help steer the transformation to a more automated era. As such, RPA implementation can be an inclusive and sustainable instrument of transformation, provided it is strategized appropriately so that there will be tangible social and economic benefits without compromising ethics or the well-being of society. Furthermore, regulators must be involved in this matter so that the Robotic Process Automation (RPA) implementation process can be continuously improved without compromising the role of accountants. Regulators should encourage a positive and cooperative relationship between technology and the accounting profession because the existence and implementation of RPA are not intended to replace the functions and roles of the accounting profession. There is a need for balanced RPA usage guidelines with the establishment of governance standards that emphasize the importance of human accountability for the results of automated systems

However, social challenges can negatively impact social implications such as job loss, so skills development must be adequately controlled to avoid it. From a technical perspective, RPA has reliability limitations on rule-based activities and integration with legacy systems. Therefore, before implementing RPA, companies need to demonstrate their technological readiness. In addition, implementing this technology also needs to focus on data security issues. Cooperation between the government, companies, and the scientific community is needed to make the right policies to face the challenges of adopting RPA, including the impact of social issues that are likely to be caused. Changes in retraining and management programs are important first steps to ensure the workforce can adjust to digital transformation. From an ethical perspective, corporate social responsibility and well-defined policies determine whether RPA is implemented with sustainability, fairness, and privacy principles. This includes data protection

and transparency in the use of technology.

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