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Robotic process automation: Implementation

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Abstract

Robotic Process Automation (RPA) is revolutionizing business process automation by allowing organizations to automate repetitive processes, improve efficiency, and cut costs. Unlike other automation methods, RPA works at the user interface level, making it possible for organizations to integrate with existing enterprise systems without making significant changes. This means it is extremely versatile in many industries, such as finance, healthcare, and customer care. Despite its benefits, issues like security threats, governance challenges, and scalability limitations are still the most critical areas of concern. In addition, the convergence of RPA with AI and ML brings new opportunities for smart automation, allowing systems to execute sophisticated decision-making tasks with little or no human intervention. This study discusses the development, advantages, and disadvantages of RPA and presents future research directions, such as the requirement for better security features, ethics, and more effective human- machine interaction to promote the sustainable implementation of this technology.

Keywords: Robotic Process Automation; Business Process Automation; Artificial Intelligence; Machine Learning; Intelligent Automation; Enterprise Systems; Scalability; Security Risk; Governance

1. Introduction

Businesses face competition in a global market that can be very unpredictable (Levitt 1993). Businesses must become nimbler and more efficient if they want to survive in the modern business environment. Due to the widespread use of computers in many processes, digitization presents numerous optimization opportunities, including analysis and BPM-based process improvement. On the other hand, BPM projects typically only tackle a small number of processes simultaneously because of limited resources (Dumas et al., 2018). More processes should be actively regulated, according to Imgrund et al. (2017) and van der Aalst et al. (2018a, b), as their distribution does not follow the Pareto principle but rather the long tail principle. More proof that this is a problem comes from preliminary proof suggesting a large portion of these lengthy procedures are broken and need fixing. As a lightweight automation technique, robotic process automation (RPA) has proven to be more suitable for quick automation projects than standard, commercially available software (including business software) or business process management (BPM) software (Santos et al. 2019). Based on previous research (Lacity et al., 2016c), this allows computer program robots to automate digitally-enabled but still manual subprocesses within business processes. It was most commonly used to automate heavy, repetitive administrative processes that occur daily, weekly, or monthly. Since RPA's lightweight automation technique allows for a quick return on investment (Penttinen et al., 2018), it was an economically relevant alternative. Several obstacles stand in the way of RPA technology, notwithstanding its popularity, expansion, and the high expectations that come with it, which states that RPA technology has hit rock bottom in the compliance and legal technology hype cycle. Nonetheless, they have proclaimed hyperautomation and related ideas as a "top strategic technology trend," which was a promise that RPA holds for enterprises. Furthermore, RPA was still in its infancy in the scientific community and had just a general understanding from a research standpoint. Asatani and Penttinen (2016) both note that there are still many unexplored areas that present difficulties. Its positioning in the hype cycle was indicative of the lack of openness

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that led to a misunderstanding of RPA and its potential. Making scalable software robots that provide value to businesses requires professional knowledge, even though RPA is typically seen as an easy-to-implement technology. Consequently, according to Huang and Vasarhelyi (2019), the first RPA implementations can fail as much as half of the time. What this implies is that there aren't any universally accepted standards on how to carry out RPA programs. validated the framework in multiple workshops by reviewing real RPA implementations to make sure it was feasible and tackled some of the issues raised. These include strengthening methodological backing for RPA acceptance and execution, facilitating social and technological execution, and, most importantly, systematically designing, developing, and evolving RPA projects.

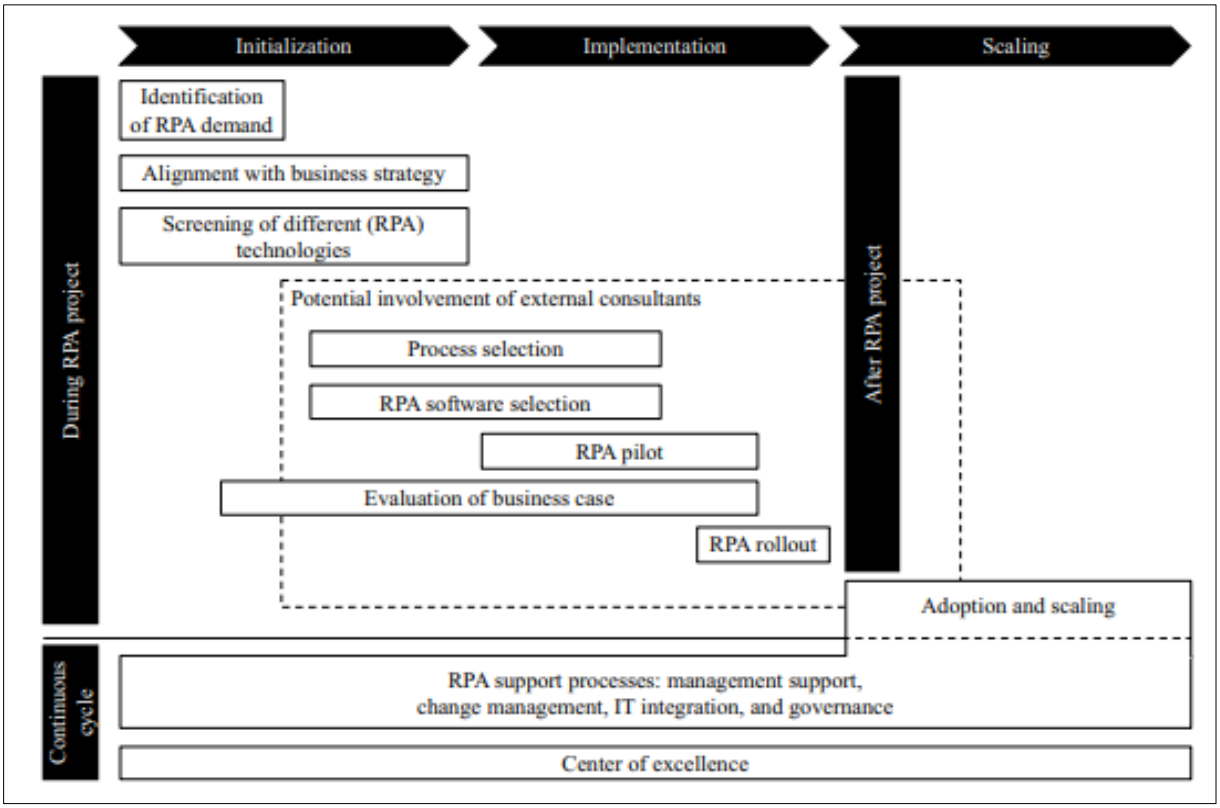

Figure 1 Framework for RPA implementation projects

In fig. 1 RPA implementation project framework, there are three main phases: initialization, implementation, and scaling. During initialization, organizations realize they need RPA, align it with their business strategy, and filter out available technologies. During implementation, they select processes and RPA software, run a pilot, and assess the business case (sometimes with outside consultants). After scaling, organizations focus on adoption and growth. Throughout the process, they offer ongoing support in management, IT integration, governance, and change management. A Center of Excellence ensures long-term success.

According to Dumas et al. (2018) and Hammer (2015), "BPM" stands for "business process management," a field of management that helps identify, document, and digitalize business processes in an organized way. Enterprise software that can be customized or more flexible business process management systems has traditionally been used for process optimization and management in large or medium-sized cross-organizational initiatives that concentrate on valuable procedures. To integrate with other applications, need to use “application programming interfaces (API)”. Additionally, individual microservices may need to be developed and invoked from a model of workflow (Gallipeau et al., 2018). On the other hand, RPA is a method that uses software robots that act like humans engaging in conversation with already-present GUI packages in a way that makes them seem more humanlike (Lacity et al., 2016c; Penttinen et al., 2018). Based on this strategy, RPA was radically in contrast to earlier, more intrusive forms of automation. One benefit of employing commercially available systems with minimal coding for RPA was that (Davenport Thomas H., 2018), thanks to the user interface, neither extensive technical expertise nor interference with the legacy software's architecture was necessary. The rapidity and low cost of RPA initiatives, which are often characterized by scripting or recording approaches instead of traditional software development, contribute to the perception of RPA as a hyperautomating corporation. Consequently, business units that will be most directly impacted by the automated process are typically the ones to

oversee RPA projects rather than the IT department. To sum up, robotic process automation is a set of tools for automating routine operations with little overhead using software robots that run on top of the user interface layer of existing applications. Not all RPA suppliers create standalone RPA software, and there are many of them (Marciniak, Róbert, and Dóra Berend, 2017). They have integrated RPA features into their preexisting solutions, which were frequently "business process management software" (van der Aalst et al., 2018a, b; Lacity et al., 2016c). There was a fundamental difference between the two software families, even though both aim to automate processes. The goal of business process management software was to orchestrate and coordinate process automation through the use of programming or application programming interfaces (APIs) that access data and the layer of business logic, which was a component of heavyweight information technology (Bygstad, 2017; Penttinen et al., 2018). When companies have extremely complicated integration and security needs, heavyweight IT can cause IT silo difficulties since the costs of addressing these issues would outweigh the benefits of making the shift (Bygstad, 2017). These problems are circumvented by RPA as lightweight IT since it just touches the display layer. One potential downside of lightweight IT integration was its lack of robustness; in the absence of a viable heavyweight IT solution, it may only serve as a bridging functionality. Furthermore, it is important to remember that automating processes, whether it has a low weight, does not always mean process optimization. This was because the deep-seated shortcomings remained unaddressed. Speed, scalability, and mistake reduction were still areas where the process could improve. Current RPA implementations of automation primarily depend on tasks with explicit definitions, such as business rules or straightforward if-then-else sentences. A workflow that incorporates multiple instances of these jobs was defined in the relevant RPA software. The integration of artificial intelligence methods into RPA is currently under investigation. This could lead to automatically determining the next task based on data or replacing current rule sets and process models with cognitive decision-making. Intelligent RPA utilizes artificial intelligence technology to enable cognitive abilities similar to those of humans for certain activities, as opposed to symbolic RPA, which depends on handcrafted process models and regulations (Schatsky David, 2017). Robots can now complete clumsy jobs that humans used to do by hand, and computers have begun to mimic human speech and hearing (Brynjolfsson & McAfee, 2014). More repetitive and human-intensive tasks have a higher potential for RPA automation (Willcocks, L.E.S.L.I.E., 2016). Automating nonroutine jobs that do not exhibit many repeating patterns was not a good idea (Asatiani & Penttinen, 2016). Some characteristics were defined by Sutherland (2013) and Willcocks & Lacity (2016) to improve a process's chances of being suitable for RPA. These qualities are illustrated in Figure 2.

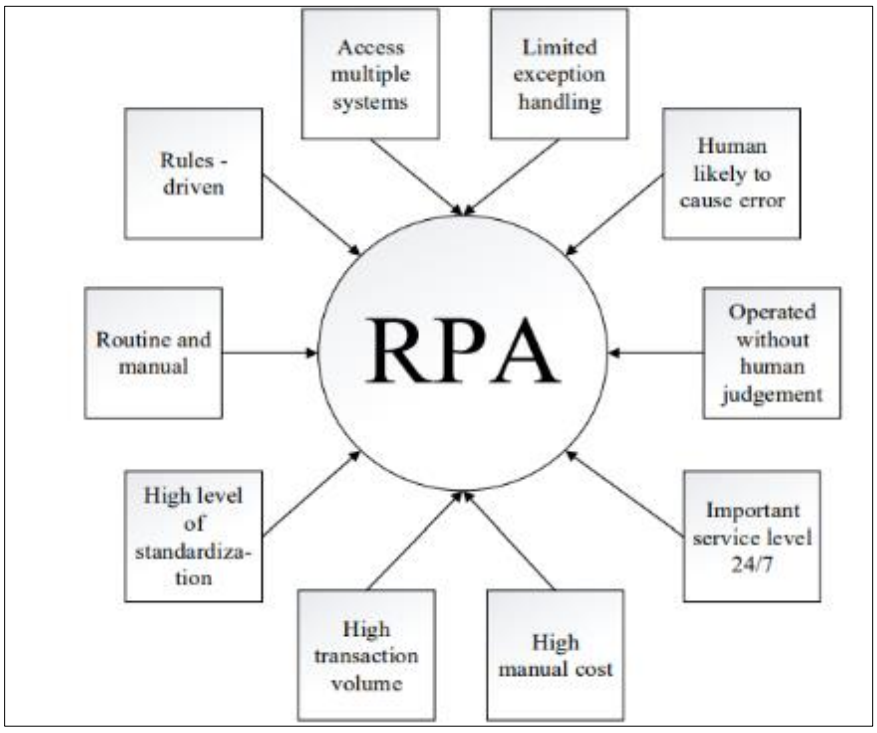

Figure 2 A characteristic of RPA processes (Sutherland, 2013; Willicocks & Lacity, 2016)

To be competitive, businesses must respond to the growing demands of their customers while simultaneously lowering costs (Brynjolfsson & McAfee, 2014). Organizations can automate repetitive and onerous processes with Robotic Process Automation (RPA) (Schmitz Manfred et al., 2016) which provides a solution to reduce operating costs Businesses that have used RPA have seen substantial savings in full-time equivalent (FTE)" In, in addition to other

advantages like as faster processing times, higher quality, fewer mistakes, and happier employees**.** Lamberton (2016) states that initial RPA projects in an organization often fail between 30% and 50% of the time. Although robotic process automation (RPA)" presents a fresh idea, the industry is expanding rapidly. It was critical to establish a plan for the adoption of RPA to prevent the typical pitfalls that lead to project failure. From defining the business concerns at the outset of the roadmap to incorporating RPA into the organization's overall strategy, this research delves into the best practices for implementing RPA. When people are no longer needed to operate a system, the system is automated (Dekker, S. W. A, 2004). This was common among many automated systems: they all aim to improve accuracy, precision, and quality by eliminating the most unreliable component—human error. When computer scientist Alan Turing proposed a systematic procedure to improve the efficiency of work operations in 1935, it was the first concept of software automation (Turing, Dermot, 2018). He left an indelible mark with his groundbreaking work on algorithms and robotics (Middelburg, 2017). When the first MIT AI labs were established in 1964, technical progress got underway. The following year, in 1965, the first Robotics Institute was established. According to Middelburg 2017), the upcoming trend in automation was service automation. The major goal of service automation, according to Middleburg (2017), was to automate unnecessary manual work; secondary goals include automating services and delivering optimal user experience. While RPA was defined as service automation by Willcocks & Lacity (2016), different words can be used to describe service automation. Things like business process management (BPM), cognitive computing, AI, scripting tools, etc. According to Willcocks and Lacity (2016), robotic process automation deals with the aspect of service automation that automates structured procedures. "A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management" (IEEE Std 2755-2017, 2017) was the definition given by the IEEE Standards Association for Robotic Process Automation. According to (Hindle, Lacity, Willcocks, and Khan, 2018) the marketing director Patric Geary the term was first used by Blue Prism, an RPA software business. "Robotic Process Automation" (RPA) in 2012. Since RPA was still a relatively new technology, there has been a lack of thorough study into its early applications. When businesses began to declare large savings as a result of automation in 2014 and 2015, RPA started to gain traction. Despite its growing importance, the RPA back-office automation market was still on a modest scale in early 2016 (L. Willcocks & Lacity, 2016). The worldwide RPA market, which includes RPA software and RPA services, grew from $271 million in 2016 to $443 million in 2017 (Fersht & Snowdan, 2017; Everest Global, 2017). According to Fersht and Snowden (2017), the market is anticipated to grow by around 94% between 2018 and 2021, following a 42% increase from 2017 to 2018. Robotic automation works better for some tasks than for others. Robotic process automation (RPA) was most useful for straightforward processes as entering data into one computer system, extracting it from another, and then transforming it into another digital output before transmitting it to yet another computer system (Willcocks & Lacity, 2016). any can observe this procedure in Figure 3, where Figure 4 shows the implementation of RPA with the right automated tool.

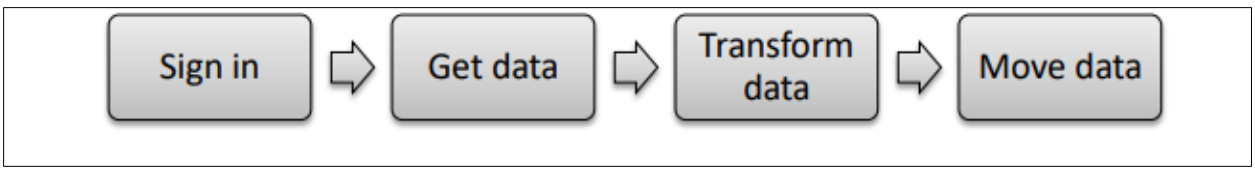

Figure 3 An illustration of a basic RPA procedure (Willcocks & Lacity, 2016)

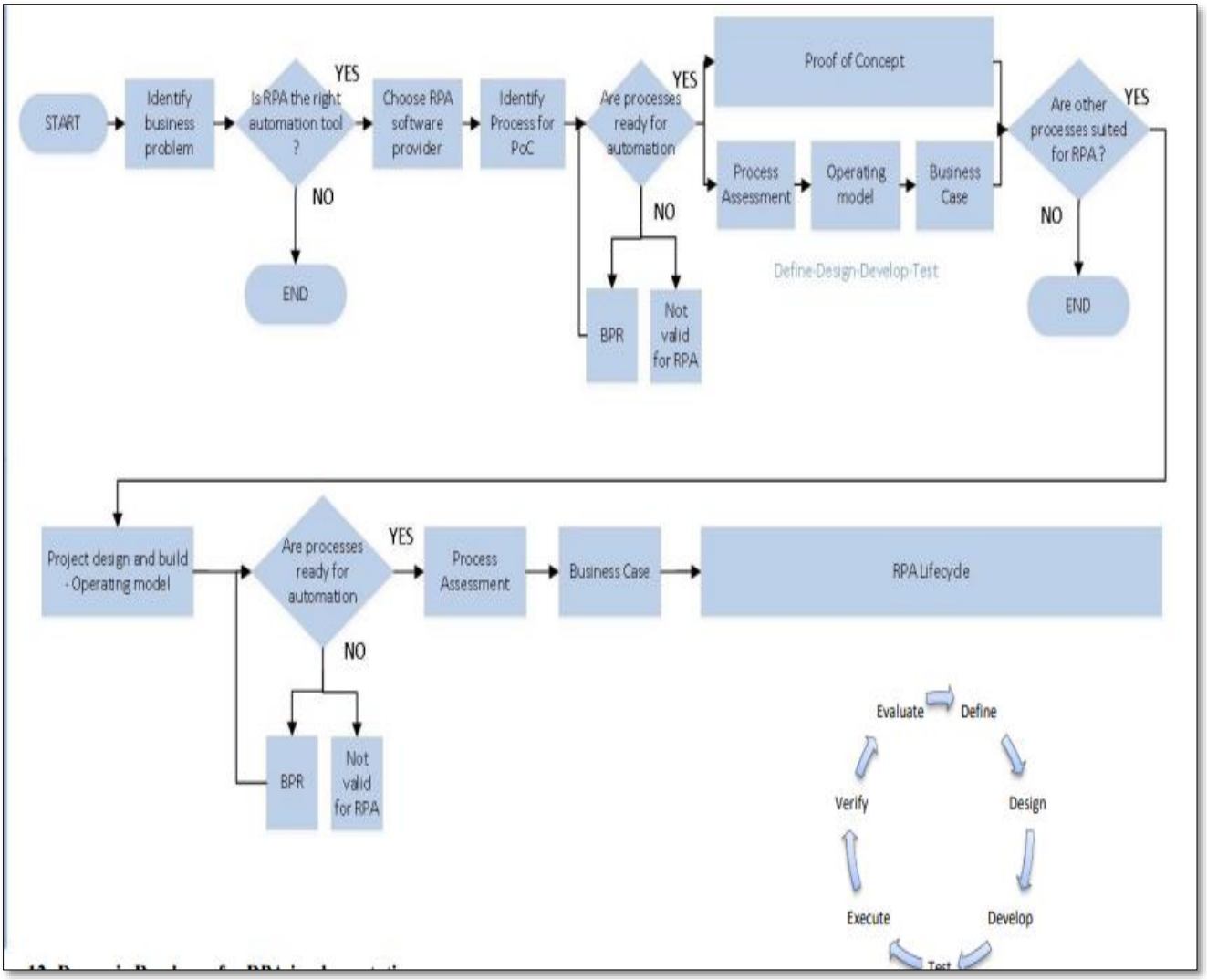

Figure 4 Dynamic Implementation Road Map for RPA (Sigurðardóttir Guðrún Lilja, 2018)

1.1. Research Question

- **RQ1:** How does RPA improve efficiency?
- **RQ2:** What are the key RPA implementation challenges?
- **RQ3:** How does RPA affect jobs?
- **RQ4:** How to ensure RPA security and compliance?

1.2. Research Aims

- **RA1:** Find RPA's impact on efficiency.
- **RA2:** Identify RPA adoption challenges.
- **RA3:** Assess RPA effect on job.
- **RA4:** Develop secure RPA strategies.

2. Literature Review

This component follows a split into three distinct formats. To start, to better understand what RPA was all about, a literature review was conducted. The assessment then moves on to examine project execution in further detail. Finding out what had been researched and considered relevant in the execution of IT projects. The goal was to provide an overview of potential components that might go into a process model for RPA deployments. Previous works were then synthesized and summarized to the deployment of an RPA model that highlights the majority of relevant aspects of the existing literature as they pertain to RPA. Automated Procedure The word "automation" conjured images of a distant

future. Physical robots doing human-like duties in an office setting is a common mental image that people have when they hear the term (Lacity & Willcocks, 2015B; Lacity et al., 2015). RPA isn't that exciting. Similar to other forms of automation, the idea was to replace human workers with robotic software that can interact with a wide range of systems, such as "spreadsheets, CRM systems, or ERP software", to complete tasks that were previously done by humans (Lacity & Willcocks, 2015; Lacity et al., 2015). Simply described, RPA is a platform and software solution that automates logical processes based on rules. These processes work with structured data that is well-defined and has a predictable set of output values (Lacity & Willcocks, 2016). Plus, it's not always fun to accomplish the duties by hand because they're so repetitious (Lacity & Willcocks, 2016). The term "swivel chair" can describe these kinds of jobs, which include delivering information through a single dimension with little thought involved (Willcocks et al., 2015B). To cut to the chase, RPA does nothing more than engage using systems in a manner analogous to that of a human.

This Literature Review commenced by looking for works in prominent databases, including Impost, IEEE, ACM, Google Scholar, and ResearchGate. The documents were gathered according to their title, keywords, and abstract. The findings are illustrated in Table 1.

Table 1 Number of papers collected by database and keyword

Database	Keyword	Number of Papers Collected
Springer	Robotic Process Automation	8
	Robotic Process Automation	0
	Process Automation	0
Google Scholar	Robotic Process Automation	12
	Robotic Process Automation	36
	Process Automation	0
IEEE	Robotic Process Automation	2
	Robotic Process Automation	4
	Process Automation	0
ACM	Robotic Process Automation	2
	Robotic Process Automation	0
	Process Automation	2
ResearchGate	Robotic Process Automation	6
	Robotic Process Automation RPA	0
	Process Automation	0

The authors discerned from their research that RPA is a nascent subject with limited existing studies, as illustrated in Figure 5. Nonetheless, interest in RPA has been increasing.

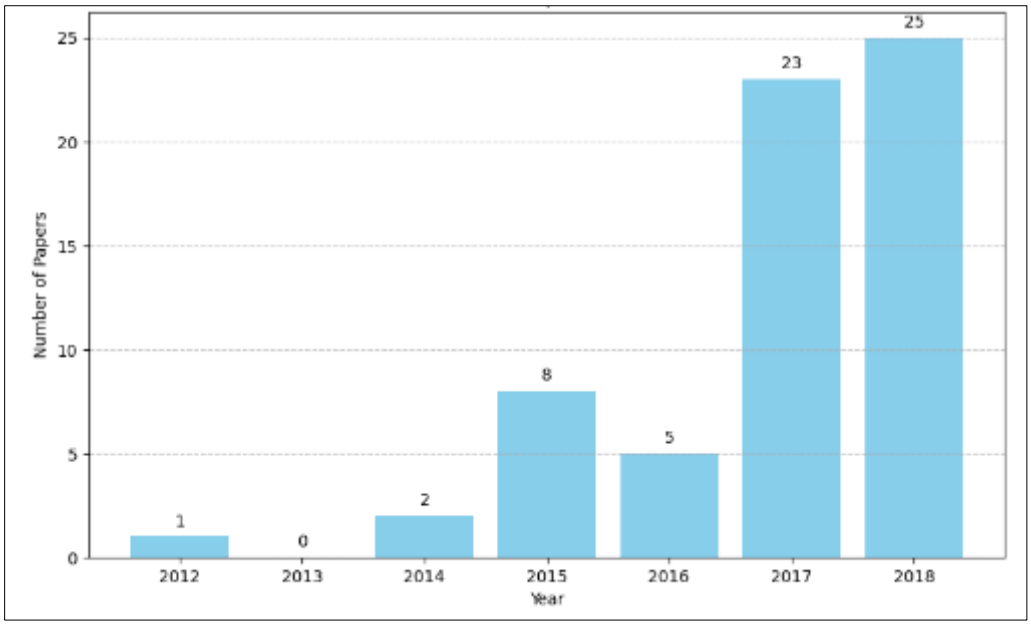

Figure 5 Evaluation of studies about RPA

As shown in Figure 5, since 2017, the quantity of publications about RPA has increased significantly. The trend at the end of 2018 indicates an increase in the quantity of RPA publications, corresponding to the number of articles from that year. The volume of Google queries regarding RPA has been rising, as illustrated in Figure 6.

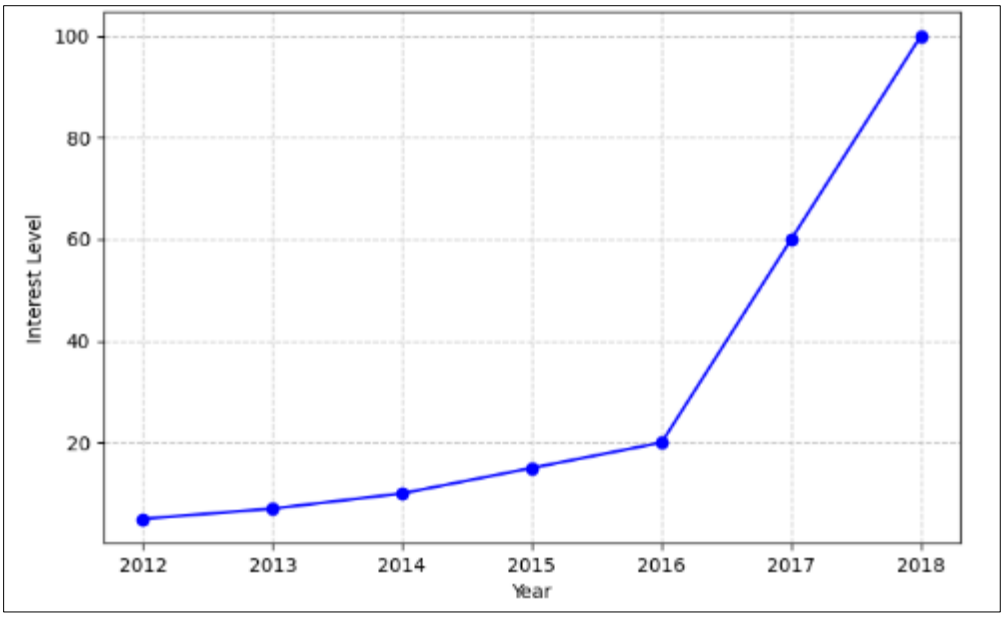

Figure 6 Interest in RPA in terms of Google searches (retrieved from Google Trends)

Willcocks et al. (2015) stated that robots can outperform humans in terms of time, cost, and quality when given a proper process and well-defined working logic. The point of implementing robots was not merely to make human workers' jobs easier. Lacity et al. (2015) argued that RPA should completely replace humans wherever possible. The human element was still necessary, but the comparison was analogous to other tools, such as Excel sheets, which help users execute various calculations. With RPA, the reasoning was different; the robot does all the computations invisibly, and the only things a human can see are the inputs and outputs (Gadre Ashwin, 2017). Since RPA doesn't use real robots, it needs to figure out how to measure robots. A software license was equivalent to one robot in RPA terminology (Willcocks et al., 2015B). The robots can be used continuously, but if you want to run ten operations at once, you'll need ten robots or licenses. For RPA, there are two key distinctions from competing automation approaches, and the word "lightness" best

describes both. At first glance, it may not appear that a deep understanding of programming was necessary to train the robots to carry out their tasks (Willcocks et al., 2015B). On the contrary, the program's setup resembled a logical flowchart, more like the rationale behind a puzzle's solution (Nystrom Robert, 2014). Programming boils down to this, but RPA eliminates languages and syntaxes to concentrate on the logic. To sum up, RPA may be implemented rapidly even without using extensive training. Additionally, according to Willcocks et al., 2015B; Lacity & Willcocks, 2015; and Slaby, 2012, RPA was seen as "lightweight" IT in terms of its design. Like a person, the robot can only access systems through user interfaces; it cannot directly write saved in a database, for example, but instead take advantage of the software's display layer mentioned in Figure 7. This was an example of how strongly related systems are to one another.

RPA keeps the underlying system running smoothly (Schuler, Juerg, and Florian Gehring, 2018). The possibility of noncompliance is low because every activity a robot does may be easily recorded (Lacity et al., 2015). Classical BPAs, on the other hand, can do things like change data "under the hood" or in a database.

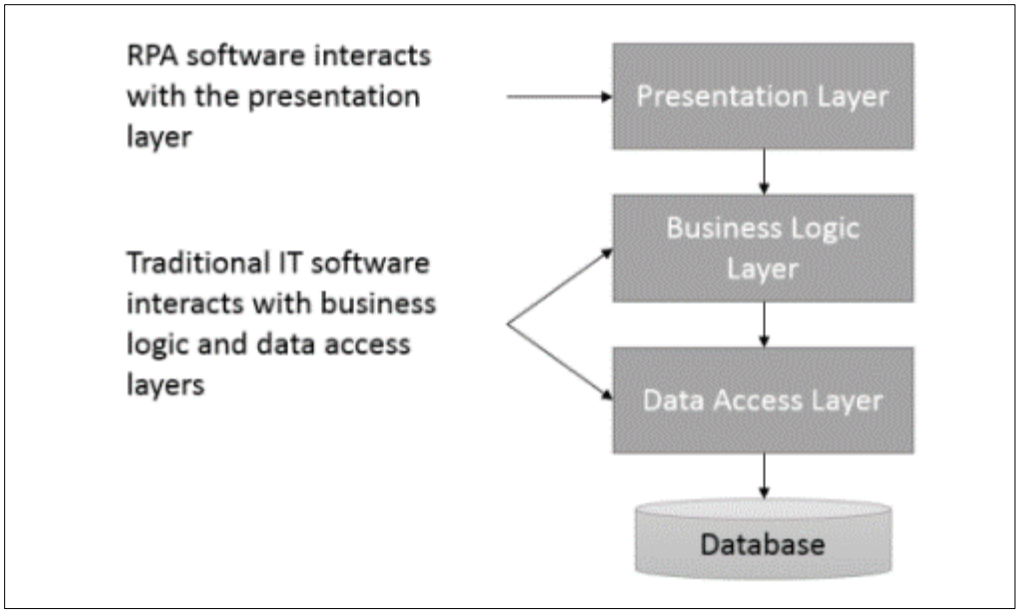

Figure 7 The software layers were modified from Willicocks et al. (2015B).

3. Robotic Band

Now that you know what RPA is and how it works, you might be wondering when and where it can be used. There was no way to implement RPA (or any other kind of automation) for processes that do not adhere to rules since, as stated by Lacity et al. (2015), robots require clear instructions on how to operate. The ideal processes to automate, according to Lacity et al. (2015), were those with a high level of standardization, a mature system, a large number of transactions, and established implicit logic. When a process is automated, these features provide the highest return. The benefits of RPA are clear: high volume leads to significant time savings and standardization, appropriate logic facilitates development and robot setup, and maturity ensures that the process will likely not vanish, preserving the resources invested in its creation. Additionally, Willcocks et al. (2015A) mentioned that repetitive jobs are good candidates for this list because human error often results from repetition. Lacity et al. (2015) presented a concept called automatable band, as shown in Figure 8, to demonstrate the applicability of automation. It shows how many transactions were involved and how long it took to finish them. The basic idea was that a procedure can be considered for automation, and it must achieve a specific level of time savings. Low volumes of lengthy procedures, large volumes of short processes, or a mix of the two can contribute to these savings.

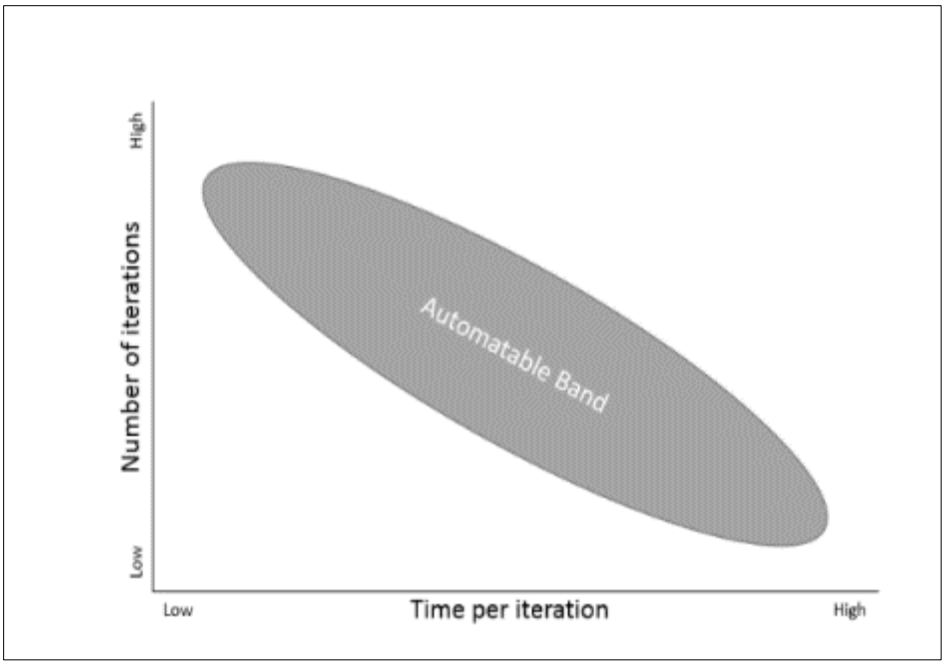

Figure 8 Automated bands were modified from Lacity et al. (2015)

Keep in mind that the automatable band isn't limited to RPA; it applies to all forms of automation. Robotic process automation (RPA) was only an option among several automation tools available to businesses today. (Lacity et al., 2015) claimed that "Business Process Management (BPM)" was an example of a more conventional automation technology. The basic idea was to examine and enhance a business's operations on an ongoing basis to get better results. Typically, business process management is implemented in processes that generate a significant amount of added value. This allows for substantial productivity increases from even little improvements. BPM was based on the tenets of activity mapping and documentation, efficiency measurement, and the pursuit of ever-increasing process optimization. In a nutshell, business process management (BPM) was an all-inclusive approach to mapping and optimizing company processes, as stated by Zarari in 1997.RPA and BPM differ in numerous respects. Reengineering processes, for example, by adding new components of sub-processes, was the purpose of business process management (BPM). RPA aims to automate preexisting processes by modeling them in their current state and then executing them using robots. From a technical standpoint, RPA eliminates the need for any additional applications other than the RPA program. However, new software for automation was often introduced by BPM. Robotic process automation (RPA) makes use of the UI layer without requiring a direct connection to a database, in contrast to business process management (BPM), which has more access to the back end of systems. Developers merely need to be familiar with the process's logic; programming abilities are not necessary for RPA, as indicated earlier. The developers in BPM were software engineers who could make user tools but didn't know much about the process they were trying to improve. Therefore, more experience was required for BPM developers because of the enormous number of ideas that must be mastered. Finally, testing requirements vary. RPA requires simple output verification and is lighter in weight, but BPM requires system testing due to its status as new software. While RPA makes element reusing more agile, BPM makes it more challenging. Both approaches have a high degree of component reuse. These elements are summarized in Table 2.

Table 2 A comparison of RPA and BPM (Slaby, 2012; Lacity et al., 2015)

Attribute	BPM	RPA
Corporate Objective	Redesign existing procedures	Streamline Procedure
Productivity Result	Updated Program	Automated process using current software
Criteria For Testing	Testing the System	Product validation
Recycling Of Components	Challenge, high	Quite high, not difficult

Return Period	Years	Months
Integration Method	Obtain the business logic layer, which was heavy-weight	Effortless, user-friendly
Developer Competence	Very thorough software development	Understated, adept in process

In contrast, business process management was cumbersome and demanded more "lightweight "IT (Willcocks et al., 2015B; Lacity & Willcocks, 2015; Slaby, 2012). How RPA differs from more conventional process automation tools, such as business process management (BPM), and how much time and effort are needed to implement each. Robotic process automation (RPA) works well for low-resource procedures that emphasize process expertise. (Willcocks et al., 2015B) argued that RPA and BPM were complementary ideas rather than substitutes. In table 3, research gaps are obtained.

Table 3 Approaches for Research Gaps

Author	**Method**	**Research Gap**	**Finding**
Lacity & Willcocks (2015)	Artificial Intelligence	Both scalability and maintenance pose difficulties.	Reduced operational and manual costs are a result of implementing RPA.
Lacity et al. (2015)	Machine Learning	Inconsistent adoption of RPA is a result of the lack of standardization in the field.	With little to no disruption to the current infrastructure, businesses can automate several activities.
Willcocks et al. (2015A)	Application Programming Interface	The topic of how to stop RPA bots from opening up new security holes requires further investigation.	It identifies serious problems with data privacy and security.
Slaby (2012)	Blue Prism Cloud	Few studies have examined its practical usefulness and recommended methods of integration.	Use RPA tools to access a wealth of cutting-edge technology that can automat smart work.
Willcocks et al.. (2015B)	AI and Machine Learning	RPA has an impact on the duties and output of workers.	It improved productivity and reduced expenses.
Sutherland (2013)	Cloud-Based Automation	A smaller set of skills is there for RPA.	It made things more adaptable and scalable.
Asatiani & Penttinen (2016)	Machine Learning	Robot process automation (RPA) cannot be sustained over time.	Using RPA, issues with the automation of the legacy system can be approved.

4. RPA Benefits

When executed correctly, RPA can yield numerous benefits. Upon reviewing the literature, the authors have synthesized and summarized the primary advantages of RPA, as detailed in Table 4. This section also presents a more comprehensive and critical review of each identified advantage. A primary advantage prompting widespread adoption of this technology by companies is its capacity for continuous operation, effectively substituting the labor of 1.7 individuals (Slaby, 2012), reducing entry costs by 70% (Anagnoste, 2017), and consequently facilitating savings in full-time equivalents (Lacity and Willcocks, 2015; Suri et al., 2017; Tran and Ho Tran Minh, 2018). Replacing humans with robots for repetitive jobs enables workers to concentrate on more significant responsibilities that require problem-solving and exception management, hence enhancing job satisfaction and staff retention (Slaby, 2012). It can generate new employment opportunities, including robot management, consulting, and advanced data analytics (Asatiani and Penttinen, 2016) while diminishing reliance on offshore full-time equivalents (FTEs) by facilitating the hiring of new FTEs (Slaby, 2012). An offshore FTE costing $30,000 can be substituted by a robot priced at $15,000 (Slaby, 2012). In comparison to people, robots exhibit fewer errors, operate more swiftly, and deliver superior quality, resulting in enhanced productivity (Alberth and Mattern, 2017) and a more rapid return on investment (Lacity and Willcocks, 2017; Suri et al., 2017). This enhances customer service, as clients exhibit greater satisfaction with the tasks performed by robots. Robots can interact with the application user interface and integrate with all applications, irrespective of the

openness to third-party integration (Asatiani and Penttinen, 2016). The robot's interaction with the user interface ensures that the apps remain unaltered, hence enhancing security (Suri et al., 2017). This indicates that they can create new functionalities more rapidly than alternative IT solutions utilizing APIs for system integration, achieving deployment within 2-4 weeks instead of months or years (Asatiani and Penttinen, 2016). Robots can adapt to service demand, demonstrating scalability and rapid expansion without significant development investment (Tran and Ho Tran Minh, 2018) and can also repurpose components to facilitate the automation of additional jobs (Slaby, 2012). The advantages of RPA are delineated in Table 4.

Table 4 RPA Benefits

Benefit	**References**
Operates 24/7 continuously	(Alberth and Mattern, 2017; Anagnoste, 2017; Lacity and Willcocks, 2015, 2017; Slaby, 2012; Tran and Ho Tran Minh, 2018)
Scalable and adaptable solutions for demand peaks	"(Lacity and Willcocks, 2015, 2017; Slaby, 2012; Suri et al., 2017; Tran and Ho Tran Minh, 2018; Vishnu et al., 2017)"
Faster task execution	"(Lacity and Willcocks, 2015, 2017; Slaby, 2012; Suri et al., 2017; Vishnu et al., 2017)"
Reduced errors with improved quality	"(Alberth and Mattern, 2017; Lacity and Willcocks, 2015; Suri et al.., 2017; Tran and Ho Tran Minh, 2018)"
Employees can focus on high-value tasks.	"(Lacity and Willcocks, 2015; Slaby, 2012; Suri et al.., 2017; Tran and Ho Tran Minh, 2018)"
Workforce optimization (FTE savings)	"(Lacity and Willcocks, 2015; Suri et al., 2017; Tran and Ho Tran Minh, 2018)"
Faster deployment of IT functionalities	"(Astiani and Penttinen, 2016; Lacity and Willcocks, 2015)"
Seamless system integration via UI	"(Astiani and Penttinen, 2016; Lacity et al., 2016)"
Higher ROI (Return on Investment)	"(Lacity and Willcocks, 2017; Suri et al., 2017)"
Boost in overall productivity.	"(Alberth and Mattern, 2017)"
Improved compliance with regulatory standards	"(Lacity et al., 2017; Anagnoste, 2017)"
Enhanced data security and confidentiality	"(Suri et al., 2017; Tran and Ho Tran Minh, 2018)"

5. RPA Disadvantages

The literature reports benefits, but that is not all. Businesses considering RPA for process automation should also be aware of the drawbacks highlighted in the article. Table 5 summarizes and synthesizes these drawbacks, and a more in-depth examination is provided later on. Because RPA is carried out by a robot devoid of cognitive abilities, which necessitates rules for proper execution, one major drawback is that RPA is exclusively appropriate for rule-based operations. It becomes more complicated to hand off processes with many exceptions to workers since humans and robots need to be in sync to complete the jobs sequentially without making any mistakes.

Table 5 RPA Disadvantages

Disadvantage	References
Only suitable for processes that include rule-based tasks	"(Alberth and Mattern, 2017 Asatiani and Penttinen, 2016)"
Possibly a provisional solution, that systematizes manual processes based on legacy IT systems	(Asatiani and Penttinen, 2016)
Increased process complexity when a part of the process still needs to be serviced by human workers.	(Alberth and Mattern, 2017)
Creation of new tasks for the workers, as robots need to be supervised.	(Alberth and Mattern, 2017)
Potential resistance from employees due to fear of job displacement	(Lacity and Willcocks, 2017)
High initial implementation cost and complexity	(Slaby, 2012; Tran and Ho Tran Minh, 2018)

6. RPA Future Challenges

Consideration of the difficulties that may arise for businesses both before and after RPA deployment is another critical component. According to the literature, numerous obstacles need to be overcome (Table 6) before RPA solutions can be widely used in the future. Additional information about each difficulty level is provided in this section as well. Since user interfaces undergo more frequent changes than the underlying data structures, robot maintenance is a significant barrier "(Kasslin, 2017; Stople et al., 2017)". Reconfiguring the robot is occasionally necessary when systems change, and it can be a tedious and expensive process.

Table 6 RPA Future Challenges

Challenge	References
Robot preservation	"(Kasslin, 2017; Stople et al., 2017)"
Competition between robots and humans	"(Asatiani and Penttinen, 2016; Suri et al., 2017)"
Can make mistakes faster	"(Kirchmer, 2017)"
Robots having wide access rights	"(Kasslin, 2017)"
Unclear division of responsibilities between IT and Bus	"(Suri et al., 2017)"
Lack of understanding of what RPA means and its application	"(Suri et al., 2017)"
Security vulnerabilities in RPA implementation	(Lacity and Willcocks, 2018)
Difficulty in scaling RPA solutions across an organization	(Aguirre and Rodriguez, 2017)
High initial investment and cost of implementation	(Van der Aalst et al., 2018)

Since the name "RPA" implies a connection to robotics when, in fact, it is associated with software robots, many people are confused about what the term means and how it is put to use. Since the robot isn't human, it can make mistakes more quickly since it doesn't have to wait for applications to respond as a person would and can't detect connection issues or complete all of its responsibilities. Another potential security risk is that a robot can have the same level of access as a super user when interacting with other systems. There is sometimes a lack of clarity between the business and IT departments when it comes to who is responsible for deploying RPA. This occurs because RPA automates procedures that are part of the business side, even though it is an IT solution. The effect on staff members is the final obstacle. Instead of hiring humans, some businesses reassign their employees to different departments, while others simply replace them with machines. Workers are still wary of robots and view them as competitors for jobs, which causes friction at work. It's crucial to address these concerns with workers before integrating robots into the workplace, even though there has been positive feedback and few job losses (Asatiani and Penttinen, 2016).

7. Applicability of robotic process automation

Capgemini Consulting performed a study to identify the tasks best suited for robotic process automation (RPA), and the results are shown in Figure 9 and Figure 10. The study considered how often and how complicated the procedures were. While RPA is best suited for automating more complicated activities that occur more frequently, more conventional approaches to business process automation tend to automate operations with low complexity and high frequency. Also, tasks that are both complex and performed infrequently should not be automated using RPA.

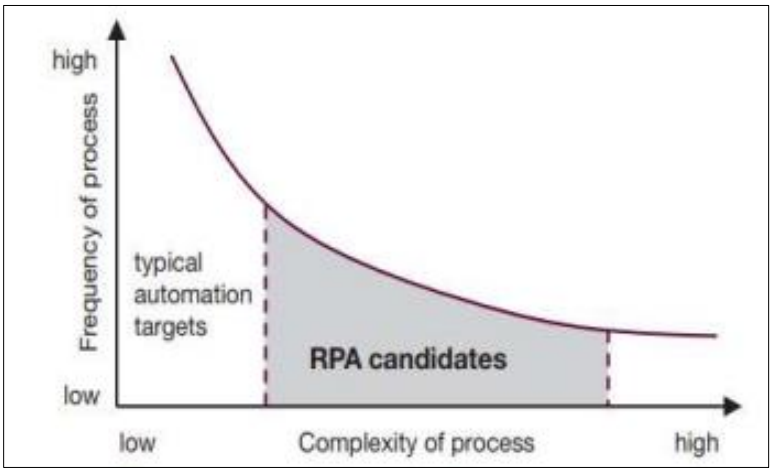

Figure 9 RPA sorts candidates according to process complexity and frequency. [Capgemini Consulting (2016)]

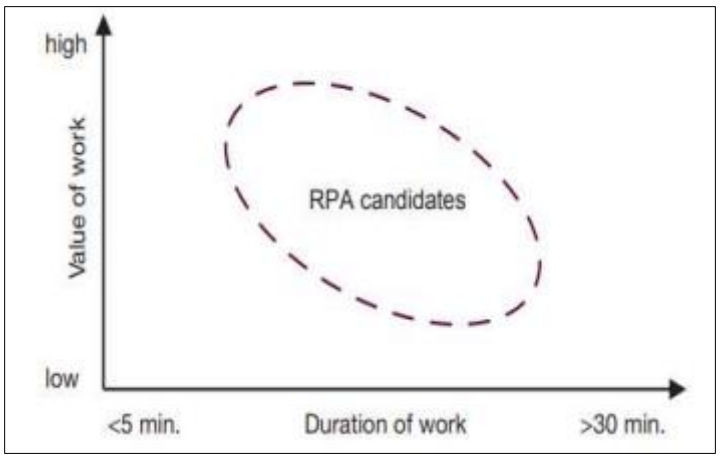

Figure 10 RPA sorts applicants according to the worth of the job and how long it will take [Capgemini Consulting (2016)]

8. Developing environments for Robotic Process Automation

To facilitate the adoption of RPA, numerous software environments have emerged in recent years. UiPath, Blue Prism, and Automation Anywhere are the market leaders, according to FORRESTER research conducted in the second quarter of 2018 (Figure 11). There are advantages and disadvantages to each of them. These findings indicate that UiPath is at the forefront of shared services. And simplicity in robot construction. Contrarily, Contextor aims for agility, whilst Automation Anywhere is characterized as an RPA technology that provides a digital workforce platform suitable for enterprises. According to Forrester's analysis, UiPath is considered a frontrunner. Some of the key features of the UiPath development environment include: - The ability to host UiPath in either virtual terminals or cloud environments - Intelligent scheduling and execution - Support for many applications - Features for both web and desktop applications - Interoperability with SAP, PDF, Java, Net, and other technologies - And lastly, the fact that it is based on Microsoft.NET technology. Among the primary capabilities offered by Automation Anywhere's RPA development environment are New cognitive features powered by AI that can automate complicated processes, support for many tenants, optical character recognition (OCR) instructions, and technology built on the Microsoft platform.

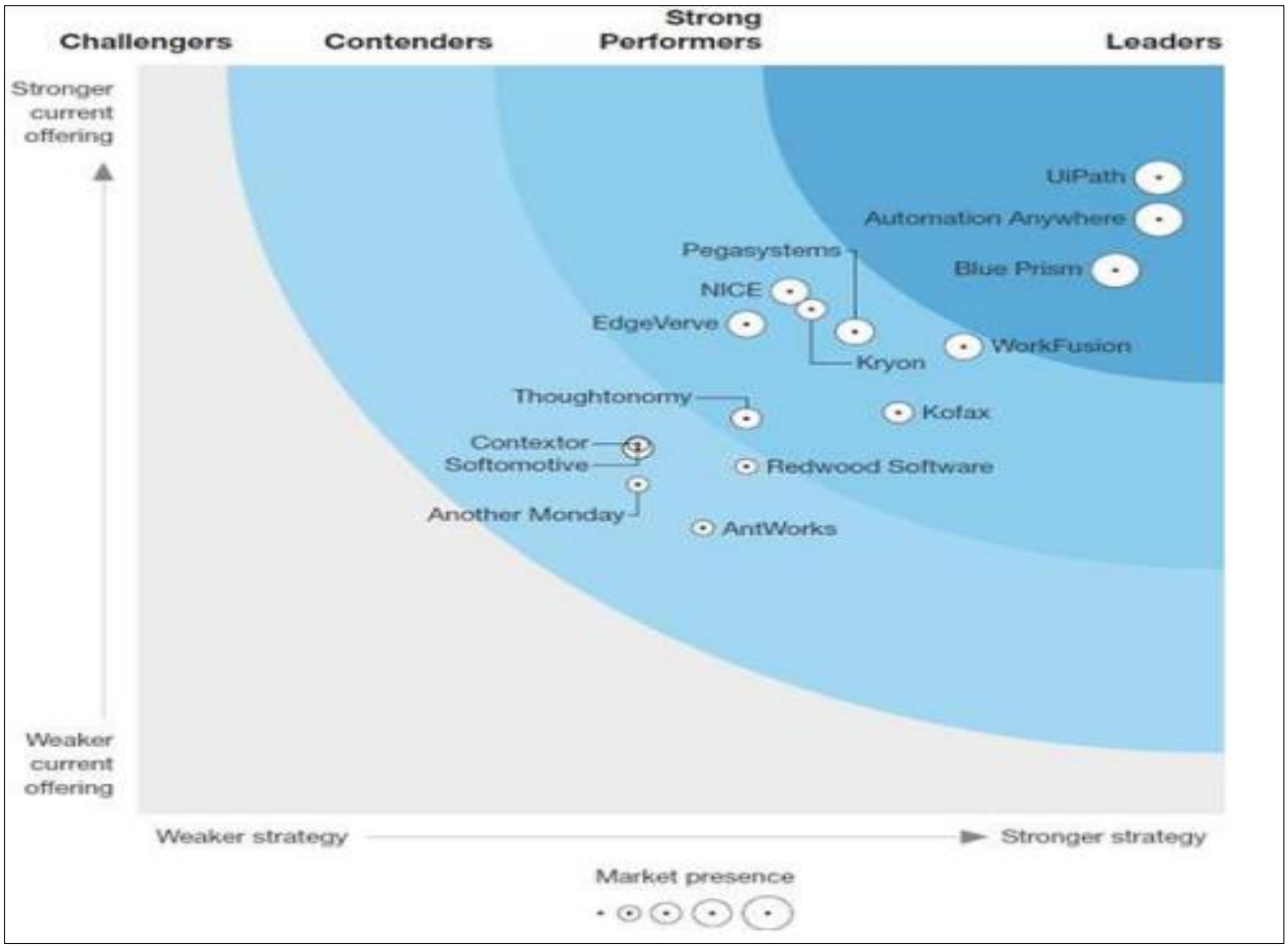

Figure 11 The Forrester way of RPA developing environments [6]

Blue Prism's development environment has the following characteristics: Excel, XML, CSV, PDF, and image document types can be automated; control of a centralized, autonomous software workforce on the cloud is safe and scalable. Automating Windows, Java, and web-based programs is also possible.

9. Conclusion

Through offering a cheap, light, efficient substitute for conventional Business Process Management solutions, robotic process automation has revolutionized corporate process automation. Unlike conventional automation approaches, RPA operates at the user interface level, enabling simple integration with present corporate systems without requiring major transformation. Its great adaptability has made it widely used in many sectors, improving operational efficiency, reducing human mistakes, and best use of resources. Still, given all its advantages, not much study on RPA—especially on its long-term impact on the dynamics of the workforce, governance, and security concerns—exists. RPA development opens great opportunities to increase cognitive automation and decision-making capacity by interacting with modern technologies such as artificial intelligence, machine learning, and natural language processing. Future research will try to improve the scalability, security, and adaptability of RPA to sophisticated workflows without violating evolving legal requirements. Second, charting the future's sustainable deployment across industries will depend critically on resolving the ethics of displacement from the workforce as well as building frameworks for interactions between human actors and RPA.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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