

An analysis of the benefits, challenges and methods of process selection to adopt robotic process automation

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RESUMO

Propósito - Robotic Process Automation (RPA) é uma ferramenta de negócios emergente que tem ganhado a atenção de organizações que buscam melhorar e transformar seus processos. No entanto, o RPA não é uma solução que se encaixe em todos os cenários existentes e, portanto, é necessária uma análise cuidadosa antes de sua implementação. Este estudo teve como objetivo realizar uma análise dos benefícios, desafios e métodos de seleção dos processos mais adequados a serem priorizados em projetos de implantação de RPA.

Referencial teórico - Além dos conceitos básicos, o artigo foi baseado em pesquisas na literatura que tratam especificamente de características e métodos de seleção de processos a serem automatizados com RPA.

Desenho/metodologia/abordagem - Trata-se de uma pesquisa aplicada, qualitativa e exploratória que adotou o método de revisão de literatura para identificar características relacionadas à tecnologia RPA. Os artigos foram pesquisados em três fontes acadêmicas: Science Direct, Scopus e Web of Science.

Resultados - Além da economia de custos, os benefícios identificados foram precisão, produtividade e consistência. Também foram sintetizados benefícios obtidos em diversas áreas da indústria. Como desafios, foram identificados e listados erros comuns em projetos onde a implementação da automação falhou e os problemas se multiplicaram, como falta de treinamento e suporte. Por fim, foram descritos métodos considerando diferentes características e critérios para definir os processos organizacionais mais compatíveis com o RPA.

Investigação, Implicações Práticas e Sociais - Assim, o estudo procura contribuir para a tomada de decisão de quem pretende compreender e introduzir esta tecnologia nas suas organizações, permitindo-lhes selecionar adequadamente os processos a serem automatizados com RPA.

Originalidade/valor - Apesar do rápido desenvolvimento do mercado em relação à automação de processos, não foi identificado um modelo único ou guia para a seleção adequada dos processos a serem automatizados com RPA, e cada método encontrado na literatura possui características específicas.

Palavras-chave - RPA; Automação Robótica de Processos; Benefícios; Desafios; Métodos.

ABSTRACT

Purpose - Robotic Process Automation (RPA) is an emerging business tool that has gained the attention of organizations aiming to improve and transform their processes. However, RPA is not a solution that fits all existing scenarios and thus carefully-considered analysis is required before its implementation. This study aimed to carry out an analysis of the benefits, challenges and methods of selecting the most appropriate processes to be prioritized in RPA implementation projects.

Theoretical framework - In addition to the basic concepts, the article was based on research in the literature that specifically deals with characteristics and methods for selecting processes to be automated with RPA.

Design/methodology/approach - This is an applied, qualitative and exploratory research study that has adopted the literature review method to identify characteristics related to RPA technology. Articles were searched for from three academic sources: Science Direct, Scopus, and Web of Science.

Findings - In addition to cost savings, the benefits identified were accuracy, productivity, and consistency. Benefits obtained in several areas of the industry were also synthesized. As challenges, common mistakes in projects where automation implementation failed and problems multiplied, such as a lack of training and support, were identified and listed. Finally, methods considering different characteristics and criteria were described in order to define organizational processes most compatible with RPA.

Research, Practical & Social implications - Thus, the study seeks to contribute to the decision-making of those wishing to understand and introduce this technology into their organizations, enabling them to appropriately select processes to be automated with RPA.

Originality/value - Despite the rapid development of the market in relation to process automation, no single model or guide for the proper selection of processes to be automated with RPA was identified, and each method found in the literature has specific characteristics.

Keywords - RPA; Robotic Process Automation; Benefits; Challenges; Methods.

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1. INTRODUCTION

Being one of the more recent technology tools for increasing the level of automation in business processes, RPA can be considered a factor of both organizational and technological change. It is an ascendant approach that uses software-based robotics to automate tasks once the domain of manual work (MADAKAM *et al.*, 2019). According to the Institute for Robotic Process Automation & Artificial Intelligence, RPA is the application of technology to configure robot software that captures and interprets existing applications in order to process transactions, perform data manipulation, and communicate with other systems.

According to Willcocks *et al.* (2015), automated processes carried out with RPA avoid conflicts of interest by removing the responsibility of IT sectors to create new systems for manual processes. Thus, a hybrid system is created, one which utilizes both an automated process and a person with specific business process knowledge skills. The application of RPA, understood in these terms, suggests that it not only relates to technology, but also to organization and culture (SOBCZAK, 2021). Other benefits can be obtained from the application of RPA, such as better business efficiency, increased productivity, data security and an improved quality of process execution (ANAGNOSTE, 2017; WILLCOCKS *et al.*, 2017; SYED *et al.*, 2020). Organizations operate different business process architectures that involve diverse characteristics, such as the duration and frequency of execution, the number of departments involved and variations in data input and output (WANNER *et al.*, 2020). Even if automation is implemented quickly, uses existing architecture and works 24/7, inappropriate automation development leads to poor decision-making, due to contextual changes. RPA is not a solution that fits all existing scenarios, therefore, and requires careful prior analysis before implementation (GEYER-KLINGEBERG *et al.* 2018).

As RPA is relatively new, lacking studies and research in terms of understanding the various aspects of its use, this article aims to carry out an analysis of the benefits, challenges, methods and criteria for selecting the most appropriate processes to be prioritized in projects to implement the technology. Thus, the article seeks to contribute to the literature on the subject, and to help those who intend to introduce the technology in their organizations to properly understand how processes to be automated by adopting RPA should be selected.

2. THEORETICAL FOUNDATION

This is an applied, qualitative and exploratory research study that has adopted the literature review method to identify characteristics related to benefits, challenges, methods and process selection criteria for the use of RPA. Articles were searched for from three academic sources: Science Direct, Scopus, and Web of Science. These well-renowned digital databases were chosen in order to select the most relevant documents detailing the use of RPA in the areas of information technology and process automation. There was no restriction on the publication date parameter of articles, recognizing that this is a new field of research with little current visibility within academia. All fields of activity in which RPA is applied were considered, from forensic science to activities in banking institutions. Keywords were selected relating to the titles of articles, as well as their abstracts. Articles that had a different definition of RPA from the one proposed for this work, for example with the meaning of the protein that binds the strands of DNA, were excluded. Also, sources with no citation were disregarded. Table 1 shows the search parameters adopted for the literature search. Articles found in more than one source were considered only once. Applying the search parameters resulted in a total of 37 relevant articles (1 article in 2015, 1 in 2016, 6 in 2017, 9 in 2018, 10 in 2019 and 10 in 2020). The increase in publications from 2018 is noteworthy.

TABLE 1 - Parameters adopted for the literature search.

Data collection	Science Direct, Scopus and Web of Science
Terms used	“RPA”, “Robotic process automation”, “RPA model”
Criteria included	“robotic process automation”
Criteria excluded	Different definitions of RPA; Sources without citation

Source: The authors.

2.1. Benefits of RPA

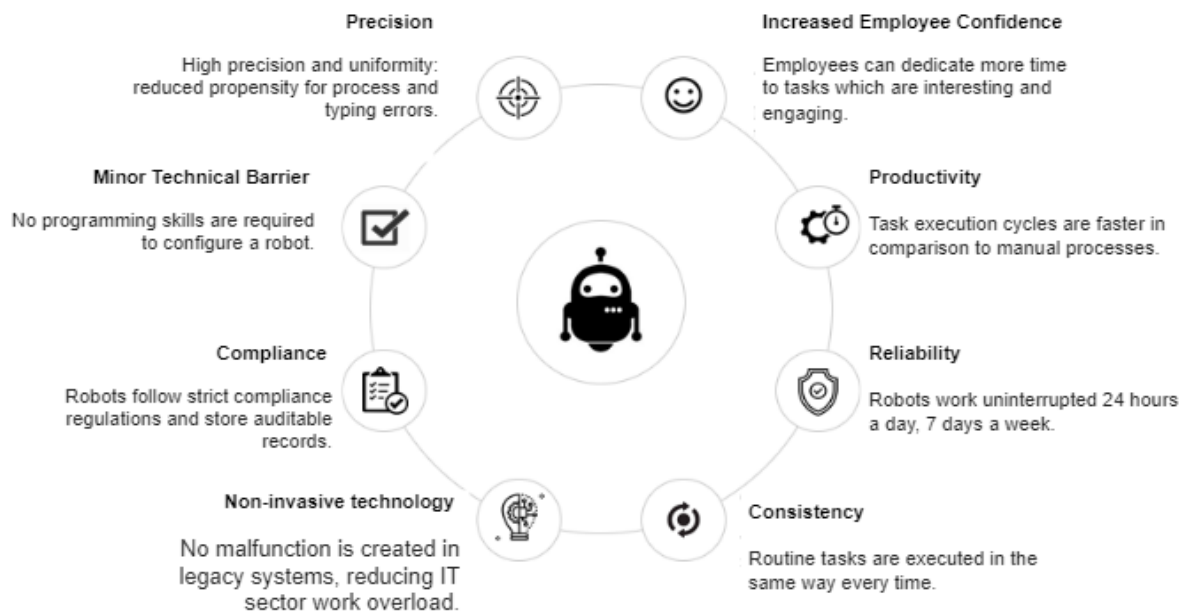
Unlike traditional systems developed within the sphere of IT, RPA solutions allow business areas, back-offices and organizations as a whole to automate processes with reduced costs and shorter implementation times. IT sectors have invested in outsourcing their services to bring down costs and increase delivery efficiency (AUBERT; RIVARD; PATRY, 2004).

However, according to the analysis by Asatiani and Penttinen (2016), while outsourcing helps to reduce costs related to the number of employees, retaining only essential

staff, there are intangible costs such as team management, and problems related to communication and workplace relationships.

Aguirre and Rodriguez (2017), Varis (2018), Leopold *et al.* (2018), Van der Aalst *et al.* (2018) suggest that cost reduction is one of the main benefits of adopting RPA. The other more general benefits of an RPA solution are accuracy, productivity, consistency, non-invasive technology, compliance and minor technical barriers, as posited by Asquith and Horsman (2019) and illustrated in Figure 1.

FIGURE 1 – Principal benefits of RPA



Source: Adapted from Laserfiche (2022).

The benefits cited by Madakam *et al.* (2019) are detailed below, together with additional benefits identified by other researchers:

(a) Accuracy: An RPA automated process will run consistently and be less prone to procedural errors that can occur when the same tasks are performed by humans. That is, assuming a given robot has been parameterized correctly, with its functionality tested and verified, it will run consistently every time. Any change of variable will result in an error, which will trigger an alert to the user indicating that the process was not completed as expected (LEOPOLD *et al.*, 2018; ROMAO *et al.*, 2019).

(b) Productivity: As noted by William and William (2019), Siderska (2020), Asatiani and Penttinen (2016), and Aguirre and Rodriguez (2017), productivity is potentially increased as the execution cycle of a robot is considerably faster when compared with manual execution. Even when an expert in a given process executes the same with familiarity and speed, an RPA robot is more efficient because its computational speed exceeds the efficiency of an individual operating a computer; this has the additional benefit of releasing a specialist from a task, allowing such an individual to engage in activities that demand investigation and interpretation, leaving the robots to run the menial tasks all day uninterrupted.

(c) Consistency: One of the biggest benefits of using RPA, as also pointed out by Willcocks *et al.* (2017) and Madakam *et al.* (2019), is that, once implemented, task routines can be executed in the same way every time. As robots can only execute previously programmed commands, unexpected task deviation is impossible. Thus, recognizing that accurate task performance is important, if a robot has been programmed correctly, implementation should naturally occur consistently.

(d) Non-invasive technology: There must be no interruption or dysfunction of the IT systems that are used to run robotic activity. RPA is therefore given application layer priority, behaving and interacting with systems like a user, as Madakam *et al.* (2019) and Riedl *et al.* (2019) have observed.

(e) Compliance: Robots developed through RPA follow regulatory compliance as they can only operate in sequential activities. If a company has policies and standards that must be followed when carrying out a certain action or task, RPA technology can be programmed to comply with them, assuming that they have been developed by an employee who knows the procedures. In addition, robotic software provides an audit trail of the actions performed and error details are stored, in case problems occur (WILLCOCKS *et al.*, 2015; USKENBAYEVA *et al.*, 2019).

(f) Minor technical barrier: Despite requiring a certain level of knowledge, as with any unknown technology, RPA offers relatively low use complexity, as programming knowledge is not a prerequisite for configuring a robot.

Table 2 summarizes the benefits of implementing RPA in a given flow or area. These observations are the result of the analyses of case studies in several areas of the industry.

TABLE 2 – The areas of application of RPA.

Author(s)	Application Area	Observed Benefits
Uskenbayeva et al. (2019)	Administrative processes – Public Administration	Even with the demands of government, there is an increase in the performance of those agencies who attend the public, in addition to reduced governmental costs.
William and William (2019)	Secretariat	Robots created with RPA to automate secretarial processes, to increase productivity in annual compliance and client requisition processes.
Costa and Ortiz (2020)	Financial	An empirical work was carried out and a considerable gain in efficiency and time consumption observed when comparing manual effort to an automated process, disregarding the learning curve while building the robots.
Asquith and Horsman (2019)	Digital Forensics	The authors observed that robots can be developed in more standardized processes that are traditionally performed by entry-level technicians, freeing them from repetitive tasks to focus on investigative activities, which demand interpretation and creativity.
Huang and Vasarhelyi (2019)	Auditing	With the application of RPA, robots performed initial processes, allowing auditors to focus on high-level tasks, such as analyzing contradictory evidence. The minimization or elimination of human errors in tasks that require value checking was also observed as a benefit, resulting in a 99.9% accuracy rate.
Ratia et al. (2018)	Health	The direct and indirect gains of automating healthcare processes were analyzed. Direct benefits included cost-saving efficiencies, through reduced manual administrative work and increased operational excellence.
Willcocks et al. (2017)	Technology Providers	After the acquisition of a third-party IT company, the company studied suffered losses. In the case study, a robot performed automated process tasks, which were previously performed in days, in 30 minutes. Furthermore, despite an initial estimation that the robot would be able to complete 80% of tasks, in practice a 93% success rate was achieved.
Stolpe et al. (2017)	Banks	One of the benefits observed was the integration of technology used in both business and IT areas. Through automation, a solution was adopted without systemic intervention and without the need to develop technical standards to support the integration.

Source: The authors.

2.2. The Challenges Of RPA

Willcocks *et al.* (2015) highlight that, despite the benefits, there are inherent challenges to implementing RPA. Incorrect or inept installation could result in profound consequences for security, systems and business architectures, as well as the potential for previously nonexistent operational risks.

Although the combination of digital resources and RPA seems simple, according to Lamberton *et al.* (2017) the development of a robotic system requires care to ensure that it is only navigating the application layers intended for the user interface of the software adopted.

Also, security and volumetric control requirements must be met without compromising performance capabilities. Lamberton *et al.* (2017), through the identification of common mistakes in failed automation installations and problems that multiplied as a result of poor implementation, identified ten common mistakes of automating processes. These errors, or challenges, are noted and endorsed by the authors, as listed below:

- Suggesting inappropriate processes for automation: Using RPA for highly complex processes is a recurring mistake, resulting in excessive automation costs. Instead, funds could be more prudently invested in less complex process automation (ANAGNOSTE, 2017; LEOPOLD *et al.*, 2018; SIDERSKA, 2020);

- Using inappropriate methodologies for the implementation of robots: Companies generally try to define implementation governance through sophisticated control software that does not add value. In the end, the benefit of a rapid development and application of robots in weeks is lost in an activation process that turns into months (LAMBERTON *et al.*, 2017);

- Assuming that the skills required to create Proofs of Concept (PoC) are the same as developing productive robots: Although some researchers (ASATIANI; PENTTINEN, 2016; ASQUITH; HORSMAN, 2019) defend the view that automating processes with RPA is simple, not requiring knowledge of programming languages, it is a mistake to imagine that training business users for one or two days is enough to automate even small processes.

- Automating a process too much or not optimizing it to use RPA: Trying to eliminate human activity entirely in a process leads to an unnecessary increase in automation effort, bringing more costs and/or delay due to the attempt to obtain the benefits expected (LAMBERTON *et al.*, 2017);

- Forgetting that an IT infrastructure exists: Most RPA tools work in a virtualized environment, allowing for alterations to dimension and scalability. As the time needed to build and implement an automated process is considerably less when compared to the development of a new application (WILLCOCKS *et al.*, 2015), IT sectors do not have time to prepare the necessary productive infrastructure, which can be a critical path to delivery;

- Promote RPA as the only resource to achieve high Return on Investment (ROI): While currently available RPA tools can automate most processes, this cannot be done fully, as some processes start through linking or document reading (HUANG; VASARHELYI, 2019);

- Robots in RPA should be managed by IT: As the RPA tool is software, companies tend to infer that it should be controlled by IT sectors. However, this approach limits the activities of business sectors, leading to a significant loss of agility, investment and potential (LAMBERTON *et al.*, 2017);
- Not thinking about robot scalability: Lamberton *et al.* (2017) highlight that a common way for companies to verify the capability of RPA is through the development of a PoC. However, there is a big difference between a successful PoC and a large-scale automation (SYED *et al.*, 2020);
- Not considering whether processes, before or after a given current project, have already been automated: Automating a process in which RPA will be used requires planning and study (MA *et al.*, 2019; BALASUNDARAM; VENKATAGIRI, 2020).
- Disregarding procedures through which processes are constantly updated and monitored, and not defining who will execute and monitor the execution of robots (LAMBERTON *et al.*, 2017).

As can be seen, addressing the feasibility of RPA in a company must take into account several factors. These include obtaining a robot license and a company developing its own automation, whether internally or through outsourcing (ANAGNOSTE, 2017). If done in RPA, investment in training, allocation of resources in new areas and processes to be automated must be taken into account (LEOPOLD *et al.*, 2018).

Finally, choosing the right activity to be automated is one of the biggest challenges for the successful adoption of RPA, according to Syed *et al.* (2020), Huang and Vasarhelyi (2019), Leshob *et al.* (2018), Anagnoste (2018), among others. However, there is a lack of empirical validation for the criteria and principles that guide the selection of candidate tasks or processes for the implementation and use of RPA.

3. METHODOLOGICAL PROCEDURES

Research results regarding the use of process automation, and more specifically of RPA, reveal the various benefits and challenges of implementing RPA in organizations (HALLIKAINEN *et al.*, 2018). Despite the rapid development of the market in relation to process automation, no single model or guide for the proper selection of processes to be

automated has been defined. The methods found in the literature, each with their own specific characteristics, are presented below.

Leopold *et al.* (2018) propose a method that determines the degree of automation of a business through text description processing. This method selects words that help to define the relationship between the process and the possibility of using an RPA. To do this, the process needs to be described in textual form, a sort of linguistic pre-processing which can be subsequently evaluated. The process results in a text, with relevant annotations from which computations used for metalinguistic prediction can be devised, thereby generating a classification of the degree of automation of a given process. The drawback of this approach is that it cannot guarantee the identification of processes that may be automated.

Leshob (2018) describes a four-step approach that analyzes business processes and verifies whether they are eligible for automation. The four stages are: process eligibility for an RPA, valuation of the potential for creating an RPA in a given process, valuation of the relevance of RPA, and finally the classification of the process applying RPA. However, even with four well-defined steps, there is no set of metrics that supports the analysis, modeling and creation of a tool for the method.

Riedl *et al.* (2019) developed a model which involves the assessment of 14 criteria to determine whether a process is automatable. These criteria are divided into technical feasibility, business potential and organizational aspects, and include an expected response value.

In terms of the technical dimension, the possibility of automating a process with available RPA technologies is evaluated, using specific criteria: Degree to which the process is based on rules; Degree of human intervention; Degree of data structuring; Degree of process digitization; and Degree of the similarity of environments.

As for the criterion of business potential, the authors address the level of expected benefit that automating the process will bring. Thus, this dimension focuses its analysis on considering the expected benefit in relation to the development time and maintenance expectations. The criteria considered are: Intensity of manual work; Number of systems involved; Maturity degree of the process; Knowledge about the cost of the process; Number of known exceptions; Frequency of systemic changes; and Number of process steps.

The third dimension, organizational aspects, connects all the dots related to business facets and processes. The latter aims to demonstrate which organizational aspects in addition

to technical and business feasibility should be taken into account. In addition, the former acts as a tie-breaking criterion when the other two dimensions fair equally in the evaluation of processes. The criteria inherent to this dimension are Risk tendency and Process standardization.

Despite the well-defined criteria for the model, a high level of pre-selection is necessary for its application. For example, the model demands that processes are analyzed one by one and plotted on a graph to determine eligibility (RIEDL et al., 2019). The authors therefore suggest that RPA experts analyze and select only well-defined processes, being those which will not require standardization or optimization when automated.

Wanner *et al.* (2020) developed a 3-step method to quantify the selection of a process for automation: automation potential, return analysis and economic value. Unlike Riedl et al. (2019), who proposed 14 criteria to determine the potential for process automation, Wanner *et al.* (2020) list only 6 criteria: Frequency of execution; Runtime; Standardization; Stability; Failure Rate; and Automation Rate. The result is a mathematical model which returns a list of quantitative indicators and recommendations that support subsequent decisions.

4. CONCLUSION

RPA is rapidly growing in prominence in organizations that aim to improve and transform their processes. In this article, we sought, through a literature review, to identify the benefits and current challenges of RPA, and describe methods that companies may adopt in their processes in order to take advantage of the technology.

In addition to cost savings, other benefits were identified, such as accuracy, productivity, consistency, compliance and low technical barriers. The benefits obtained by implementing RPA in various areas of industry were also summarized. As challenges, common mistakes were listed in projects where automation failed. These include problems that multiplied and became challenges due to poorly-managed implementation, such as understanding RPA as a very simple technology, a lack of training and support, and choosing processes which were unsuitable for automation with RPA. At the end of this article methods with different characteristics found in the literature are described. These can be evaluated and used by those who intend to use this technology to define which organizational processes are most compatible with RPA.

As future work, case studies could be carried out to confirm or add to the findings highlighted by the literature review, or to compare the methods identified.

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