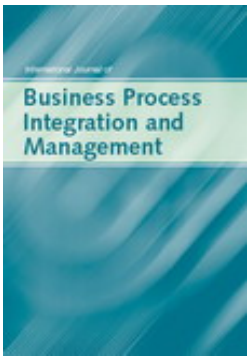

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Ana Julia Dal Forno, Karina Novakoski Fagundes, Ciro André Pitz, Maiquel de Brito

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Robotic process automation for the advance payment to suppliers process

Ana Julia Dal Forno*

Textile Engineering Department,
Santa Catarina Federal University – Campus Blumenau,
Rua João Pessoa, 2750 – B110,
Velha, CEP 89036-256,
Blumenau/SC, Brazil
Email: ana.forno@ufsc.br
*Corresponding author

Karina Novakoski Fagundes

Santa Catarina Federal University – Campus Blumenau,
Rua João Pessoa, 2750 – B110,
Velha, CEP 89036-256,
Blumenau/SC, Brazil
Email: kfagundes79@gmail.com

Ciro André Pitz and Maiquel de Brito

Control, Automation and Computer Department,
Santa Catarina Federal University – Campus Blumenau,
Rua João Pessoa, 2514 – C303,
Velha, CEP 89036-004,
Blumenau/SC, Brazil
Email: ciro.pitz@ufsc.br
Email: maiquel.b@ufsc.br

Abstract: In the corporate environment, several activities are performed manually, forcing operators to perform repetitive tasks instead of focusing on process improvement. For this reason, organisations are investing in robotic process automation (RPA) tools to perform the tasks, providing quality and productivity gains. This work aimed to use the Blue Prism software to automate the advance payment to suppliers process, which replaces the manual work of an attendant with a robot. The development was carried out for the administrative department of a company in the food sector located in Gaspar/SC, Brazil. The activities developed by the robot range from the initial service on the portal, Service Now, to the inclusion of the advance in the SAP system, and the closure of the service. The results showed an increase in efficiency and productivity, with an annual gain of 28 hours, in addition to system integration, and a decrease in service errors, which provides quality to the information.

Keywords: ERP; process improvement; Blue Prism; software integration.

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Biographical notes: Ana Julia Dal Forno received her PhD in Production Engineering from the Federal University of Santa Catarina in 2012. Since 2014, she is Professor at the Department of Textile Engineering at the Federal University of Santa Catarina campus Blumenau. Her research focus is in innovation management, benchmarking, lean manufacturing and Industry 4.0 technologies.

Karina Novakoski Fagundes has a degree in Control and Automation Engineering from the Federal University of Santa Catarina (UFSC – Blumenau). She has experience in graphical interfaces and in the RPA area, with an emphasis on Blue Prism software. He is currently working at the company Bunge as a developer of RPA projects and KPI analysis.

Ciro André Pitz received his PhD in Electrical Engineering from the Federal University of Santa Catarina (2015). Since 2018, he is Professor at the Department of Control, Automation and Computational Engineering at the Federal University of Santa Catarina campus Blumenau. His present research interests include adaptive signal processing theory and its application in communication systems.

Maiquel de Brito received his PhD in Electrical Engineering from the Federal University of Santa Catarina (2016). He is Professor at the Department of Control, Automation and Computational Engineering at the Federal University of Santa Catarina Campus Blumenau. His research interests are related to programming languages and logic, artificial intelligence, and specifically, to the area of multi-agent systems, on subjects such as models, languages and tools and programming of organisation, society, institution and environments in this type of system.

1 Introduction

With the evolution toward digital transformation, companies increasingly need to adapt and eliminate manual and repetitive tasks that cause process errors and delays. However, not all systems are interconnected, requiring the extraction of databases, the joining of data, and the incorporation of one application into another. For such, technological tools have emerged that offer system interaction services that promote quality in the execution of tasks, in addition to bringing productivity. These tools are called robotic process automation (RPA) and are 'virtual robots' for process automation, imitating the steps performed by an operator with the applications intelligently. RPA enables the interaction between systems, browsing web pages, extracting data, and sending reports without the intervention of a human being, ensuring a more robust process with information quality (Aguirre and Rodriguez, 2017; Syed et al., 2020).

This paper aimed to implement RPA for the advance payment to suppliers process in a contracts cell of a food company. The contracts cell is responsible for adding and changing the new supplier contracts in the SAP system (the system responsible for the organisation's data processing) and adding the request for advance payment to suppliers. The solution described in this work is based on using the Blue Prism (BP) software as an RPA tool to automate the advance payment to suppliers. The activities developed by the robot range from the initial service on the company portal, Service Now, to the inclusion of the advance in the SAP system and the closure of the service. The advance payment to suppliers process requires automation due to the high monthly volume and, more specifically, because it is a job that needs agility, both in the service and creation. Therefore, automating this step brings benefits, such as error minimisation, standardisation, and increased service speed.

The methodology began with theoretical mapping using the combined keywords 'Blue Prism' and 'RPA', resulting in seven publications from the ScienceDirect database and four from the IEEE Xplorer database. The search was conducted in April 2023 and used the period since 2018 as a filter. Even so, the total of only 11 publications shows that this topic still has academic gaps. The implementation of the automated system with RPA was characterised as action research, which, according to Cauchick-Miguel (2019), is a widely used method to study research problems in an organisation with the aim of solving problems "in which researchers and participants representative of the situation are involved in a cooperative or participatory manner."

This paper is structured in three sections in addition to this introduction. Section 2 is dedicated to analysing the methods used in the literature to address RPA and Blue Prism. Section 3 presents the construction of the model with the steps for development, in addition to the results that ranged from the definition of the functional requirements of the advance payment to suppliers process to the implementation of the advance in the SAP system and the comparison of the performance of the developed automation system with the manual process. Finally, Section 4 describes the final considerations of this work and future proposals for improvements.

2 RPA: characteristics, advantages, and disadvantages

The term RPA started to be used in 2012 by Patrick Geary, the marketing director of the Blue Prism software, but was only patented in 2017 by Cyrille Bataller and Adrien Jacquot through the European Patent Office (Fernandez and Aman, 2018; Bataller and Jacquot, 2015). As it is a recent field of study, the literature presents several definitions; however, most of them define that the purpose of RPA is to replace the agent that performs the tasks with 'robots' that can interact with any application or system replicating human actions, aiming to increase the efficiency of processes and the effectiveness of services, saving time and money (Syed et al., 2020; Huang and Vasarhelyi, 2019).

These 'robots' perform repetitive, high-volume, long-running tasks (Asquith and Horsman, 2019; Issac et al., 2018) based on the established rules for conducting the process (Willcocks and Craig, 2016). RPA 'robots' are fictitious since they are not machines that move around offices to perform tasks. In fact, they perform manual tasks and allow employees to dedicate themselves to strategic activities, such as solving problems, improving processes, analysing, and other value-added tasks, resulting in greater employee engagement (Aguirre and Rodriguez, 2017).

RPA is generally used in administrative sectors, which use management systems recognised in the markets. According to Aguirre and Rodriguez (2017), it is necessary to pay attention to some characteristics of the process that will be automated, given that not all processes are suitable for automation. The process must have a low cognitive level, i.e., well-structured tasks with high chances of human failures due to manual work, being repetitive and with high volume. The main RPA characteristics are the following:

- *Standardisation:* Automation standardises the way existing activities are performed based on the rules and designed flow of the automation, seeking the most secure and easiest way to accomplish a task (Willcocks and Craig, 2016).
- *Reduction of repetitive work:* RPA does not intend to remove the workforce. The goal is actually to "improve the accuracy, speed, and agility and remove the need for humans to perform repetitive tasks" (Rutaganda et al., 2017).
- *Reliability:* Since the 'robot' will follow all the defined rules, the responses will be consistent, and the data will be secure, with a minimal possibility of data exposure risks by the 'robot' (Syed et al., 2020).
- *Productivity:* A 'robot' operates much faster compared to the speed of human work (Aguirre and Rodriguez, 2017)
- *Assertiveness:* The amount of errors is very low since it is possible to handle exceptions and map errors in the process.
- *Scalability:* With a vast number of processes by areas in a company, new processes may be created using existing automation as a basis, which facilitates the automation of new tasks (de Andrade et al., 2022).
- *Process control:* RPA provides greater control over the entire process being automated. It knows the time required to perform the tasks and may be started according to the time and request of the client (Balakrishnan et al., 2021).
- *Financial return:* Since it can perform several complex tasks, RPA brings a high potential for short-term financial returns (Asquith and Horsman, 2019).

Starting with the advantages, RPA improves process efficiency by replacing the manual tasks of an employee, reducing the cost of labour and the execution time of high-frequency tasks. The operational cost decreases since the RPA software works 24 hours a day and seven days a week, uninterrupted, without the need for breaks, and with 100% reliability and accuracy (Huang and Vasarhelyi, 2019). In addition, the effectiveness of the services improves with the quality of the information since process accuracy is improved as long as the programming is well structured with error mapping (Balakrishnan et al., 2021). RPA offers flexibility and scalability, with the possibility to be scheduled for specific times, and the robot has the ability to execute many types of processes and may be quickly assigned to other tasks. Another capability of RPA is to perform a flow of tasks from end to end, going through various software and integrating several applications.

However, if it is necessary to make a decision that is not within the scope of its rules, RPA will not be able to fulfil the task. Therefore, if the system that seeks automation presents several conditions and does not follow a pattern, using RPA connected to artificial intelligence (AI) is ideal. Another disadvantage is that RPA needs solid theoretical foundations that allow reasoning around its application and development. This, in turn, hinders initiatives to achieve significant advances in the area (Syed et al., 2020).

2.1 RPA tools

Several tools in the RPA market developed in standard programming languages, such as C#, Java, JavaScript, and Python, among others, may be used to develop automation (de Andrade et al., 2022). The tools are used for the creation and maintenance of the 'robots', in addition to monitoring during operations.

The current RPA leaders and pioneers, according to (Gartner, 2023), are UiPath, Blue Prism, and Automation Anywhere. All these tools stand out for their level of competence, security, support, and functionality. The three leading tools have more straightforward interfaces for development, relying on the drag-and-drop system, allowing flows to be created via block diagrams.

In second place, the Blue Prism software applied in this research was created in 2001 by a group of automation experts aiming to improve the efficiency and effectiveness of organisations (Issac et al., 2018). Their focus was on the administrative portion, where they recognised a considerable unmet need for automation. The Blue Prism tool is based on the C# programming language and uses the concept of block programming with a friendly and intuitive interface for less experienced users. The three main components of this software are called object studio, process studio, and control room.

3 Development of RPA automation in the advance payment to suppliers process

This section is dedicated to the development of the proposed RPA automation for the company located in southern Brazil. This multinational company was founded in 1818 in Amsterdam and Antwerp, with operations in the agribusiness, food, and ingredients sectors. The Blue Prism platform, the SAP software, and the web pages of the company's system, known as Service Now, were used. The Blue Prism tool has already been described in Section 2. The SAP is an enterprise resource planning (ERP) system responsible for the organisation's data processing and has the ability to connect with other applications. Finally, Service Now is a platform capable of managing corporate services, providing the possibility of visualising all areas of the company. Calls are opened on these platforms that are

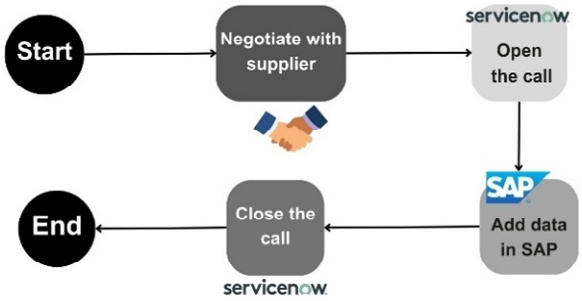
new demands of the organisation, changes, or divergences between others.

3.1 Description of the current process

The process of advance payment to a supplier is defined at the time of the negotiation, when the company commits to paying the supplier before they deliver merchandise or performs a given service. After that, the negotiator must open a call in the Service Now company system to request the advance payment to the supplier, filling in the supplier's information and the payment amount, which will be analysed and approved for the release of the money. The call opened by the negotiator is sent to the service Delivery – PTP contracts cell attendant, who checks during the day if new calls have been opened. Due to the relevance of the advance payment to suppliers, the service should be carried out as soon as possible.

To answer the call, the attendant must enter the information into the SAP system in the F-47 transaction using the information that the requester added. After, the call is finalised, and the advance number is created. Figure 1 shows the flow of this process.

Figure 1 Process flow chart (see online version for colours)



To open the call in the company's system, the employee must access the company website and look for the advance payment to suppliers call queue. The pieces of data required to open the call are the name of the call, name of the supplier company, country, type of request, company code, procurement document that will be linked to the payment request, line of the contract that will be advanced, supplier code, amount of the payment to be advanced, fees, and date on which the payment must be made, in addition to the legal and commercial contracts that must be attached.

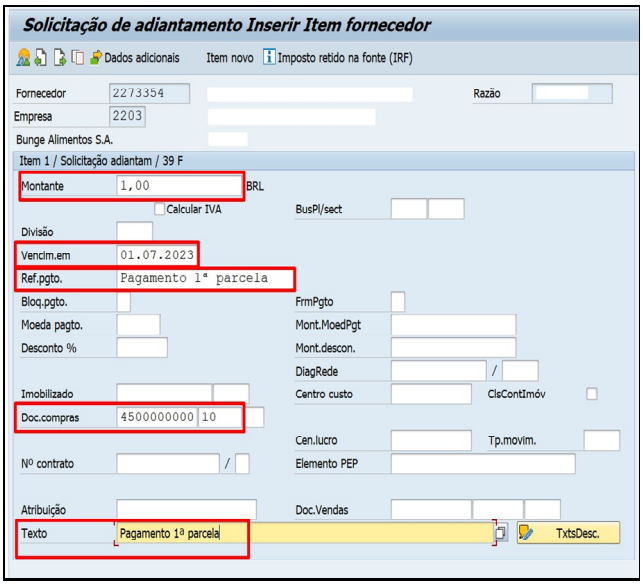
To answer the call, the attendant needs to access Service Now, search for calls that have not been resolved or cancelled, use the assignment group for the contracts cell, and specify the advance payment to suppliers queue. After the filter, pending calls that need servicing will be displayed. After accessing SAP and entering transaction F-47, it is possible to view the first page of the transaction, where the following fields must be filled in:

- *Document date:* The current day it is being added to the SAP system.
- *Company:* Internal company code.
- *Currency/exchange rate:* Currency used.
- *Reference:* Call number.
- *Doc. cab. txt:* Brief text explaining the advance.
- *Account:* Supplier code.
- *Destin. RzE code:* capex or opex.

On the second page of the F-47 transaction (Figure 2) one must add:

- *Amount:* The amount of the advance.
- *Maturity:* If the company is Brazilian and the call is opened from the 1st to the 14th day, the maturity will be the 15th of the month. If the call is opened after the 15th day of the month, the maturity will be the 1st of the following month. If the supplier is from a country other than Brazil, it is necessary to include the date indicated on the call.
- *Payt. ref.:* Brief text explaining the advance.
- *Purchase doc.:* Purchase document that will be linked to the advance.
- *Line:* What line of the purchase document will be paid in advance.
- *Text:* Brief text explaining the advance.

Figure 2 Second page of the F-47 transaction (see online version for colours)



After completing the creation of the advance in the SAP system, one must return to Service Now to resolve the call and add the number of the advance created. It should be noted that in the event of a failure during the completion of the F-47 transaction, the advance in the SAP system will be cancelled, and it will be explained in the resolution of the call that it was cancelled due to incorrect data filled in by the negotiator in Service Now.

3.2 Proposed solution

The RPA was designed to perform the tasks described in Subsection 3.1. The automation has a linear flow that transitions between Blue Prism, Service Now, and SAP pages, in which eight pages were used. The Main Page, Populate Queue, Work F-47, and Close Ticket pages were created and followed the standard of the studied company. In turn, the other pages are organisation standards for any process created, so they were attached.

Step 1 *Main page* – The starting page of the process is the main page, with a beginning, middle and end. This is where the main flow of the robot is defined. The main parameters used are separated into blocks:

a Process settings which contains the name of the queue, where the items you want the robot to process will be populated.

b The credentials block – Service Now, which contains the credentials to access Service Now.

c The data block which is the data that will be processed.

d And the last stopping control settings block that limits the number of times the process will remain in a loop if it is unable to complete the tasks.

The main page flow starts on the start up SAP page responsible for starting the SAP application. The next step is to populate the queue on the populate queue page, responsible for accessing Service Now with the credential parameters and collecting open tickets. With the data in the queue, the get next item action will set the first item that will go through the decision (got item?). If there are items to process, go to page work-47, which will be responsible for adding the advance in SAP. If the item does not have any errors and is processed correctly in SAP, it will proceed to the next page mark item as completed, marking the item as complete. If there is any error on the work-47 page, it will go to recover, which will store the exceptions in a collection and mark the item as an exception on the mark item as exceptions page. Next, you need to 'reset' the parameters on the reset global data page and close the ticket in Service Now on the close ticket page. If there are more items, it will follow the process, otherwise it will close SAP and Service Now on the close down page and complete the process. Figure 3 shows this step.

Step 2 *Start up SAP* – The start up sap page parameters were separated into blocks such as app credentials, process, and retry.

Step 3 *Populate queue* – The populate queue page parameters were also separated into blocks called settings, retry, and process. It contains the general data of the call, including the number of the call, the person in charge, and the day and time of the opening, among other data. In turn, the collection variables contain information filled in the call by the negotiator, such as supplier code, advance amount, and other information. The retry block is used for the exceptions, having the same function as the retry block from the previous topic. Finally, the process block checks if the queue is blocked and the state of the process. The populate queue page flow, illustrated in Figure 4, begins by checking if the queue is blocked. If it is blocked, the process ends; otherwise, it goes on to mark the items that may have been left unprocessed in the previous execution as the control room. The next step is to access Service Now and select the calls in the get cases action. Then, in the loop, the data of the calls will be collected and compiled to add to the queue. Finally, it is necessary to lock the queue so that another process does not use the data and proceed to the End. If it cannot find the calls in Service Now, decision retry will use the comparison of retry limit and retry count blocks by executing the block only three times; otherwise, an error message will be shown. The retry block is used for the exceptions, and the Process block checks if the queue is blocked and the state of the process.

Step 4 *Work F-47* – Due to payment restrictions, i.e., because of two payment date options, the *comparing date parameter was created*. The work F-47 page flow begins by updating the date of the current day. The next step is to enter the F-47 transaction in the SAP system and, after the definition of the supplier's country, the amount of the advance added is higher than that registered in the SAP system, and it will not be possible to finalise the advance; or else, save the document, store the created advance message, and return to the SAP home page.

Step 5 *Close ticket* – Simply and intuitively, it is used to add the advance number in Service Now and close the call.

Figure 3 Main page (see online version for colours)

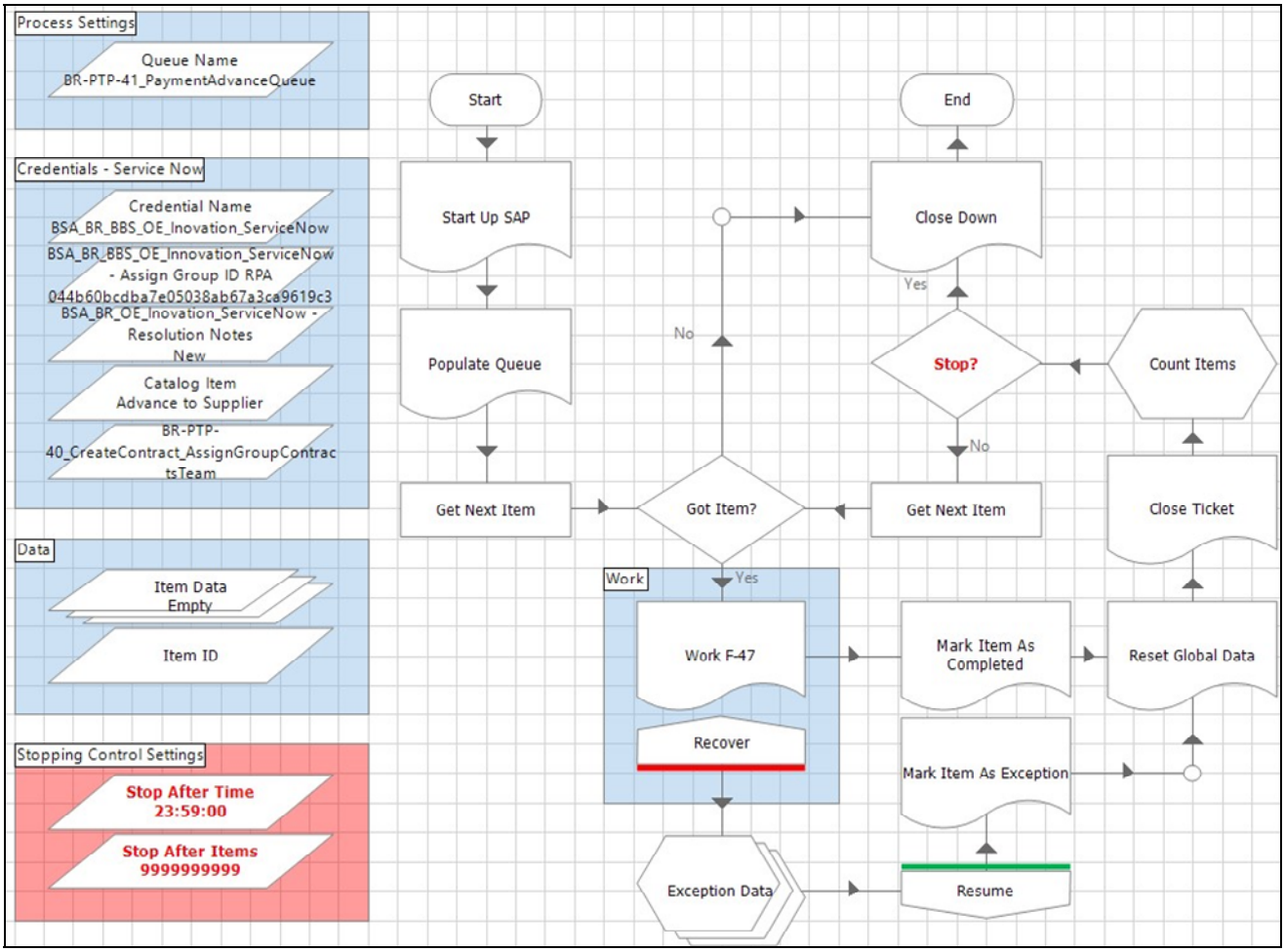
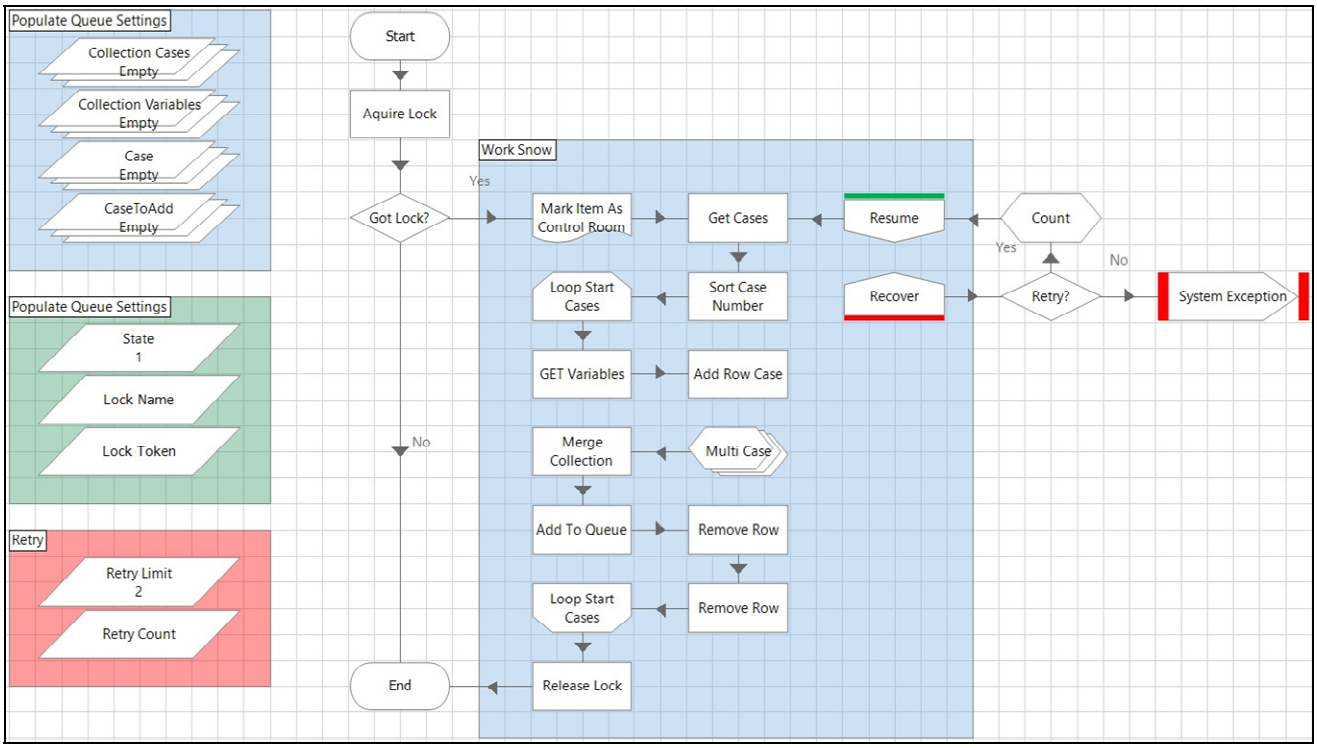


Figure 4 Flow of the populate queue (see online version for colours)



Steps 6 and 7 *Mark item as complete or exceptions* – These control pages finalise the items having as options items completed or marked as exceptions, in which case they require more care.

Step 8 *Close down* – Terminates processes in case of unexpected errors, closing Service Now and the SAP system.

The tests carried out demonstrated that automation can carry out the activity quickly. The automation needed 34 seconds to execute five calls, with this process taking nine minutes and 30 seconds when performed manually (Table 1). This represents a productivity gain of eight minutes and 56 seconds, indicating that automation is approximately 16 times faster in creating an advance than the manual process. If the robot services 20 calls per week, the estimated gain is 28 hours per year. It is important to note that automation was not created only to achieve time gains but rather the availability of uninterrupted service.

Table 1 Comparison of service times for manual vs. automated calls

Process type	*Time of five calls*	*Average per call*	*Time reduction*
Automated	34 seconds	7 seconds	94%
Manual	570 seconds	114 seconds	

4 Final considerations

This article aimed to develop an RPA solution using Blue Prism software to service the request of payment to suppliers. The tests proved the advantages of using RPA, especially regarding increased productivity and speed, system integration, error reduction, and improved information quality. The integration between the SAP system and Service Now brought many benefits to the company. In academic terms, the gains are in line with the results mentioned in the RPA research by Syed et al. (2020), Huang and Vasarhelyi (2019) and Balakrishnan et al. (2021).

Some difficulties identified were to write in the SAP fields that contain commas and value fields, with it being necessary to use code to access these fields instead of actions. The code is provided by the SAP that identifies the fields, and it is only necessary to change the parameters that will be entered. Another difficulty understood the queue logic involved in Blue Prism, in which all items need to go into the queue and, in the end, must be marked as an exception or completed.

As future recommendations, we expect to augment the process by sending an email notifying the approvers and the requester that the advance was created, or even use the connection logic between the SAP and Service Now systems to automate other activities. In addition, the diffusion of RPA applications has become necessary for the evolution of research in this field of knowledge, exploring its advantages in the most diverse administrative processes.

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