

An Overview of Robotic Process Automation

Bojana Naumoska
Faculty of computer science and engineering
Ss. Cyril and Methodius University in Skopje
 Skopje, Macedonia
 bojana.naumoska@students.finki.ukim.mk

Georgina Mirceva
Faculty of computer science and engineering
Ss. Cyril and Methodius University in Skopje
 Skopje, Macedonia
 georgina.mirceva@finki.ukim.mk

Abstract—There are some segments of the business that require simple and everyday tasks, high-risk steps, or processes that include multiple people and steps, so implementing these working requirements can be automated, and it can leave more time for the employees to dedicate themselves to more important business goals. Process automation is simplifying complex business processes with the help of the technology. Robotic process automation (RPA) is one of the ways how a company can imitate human tasks through robots (bots). RPA is focused on the automation of repetitive actions, aiming to bring organizations an easier way of handling these actions in the most efficient way. RPA is helping companies in achieving maximum results in an effective manner. The purpose of this paper is to highlight the advantages of robotic process automation and the positive influence that this process is having over the business sector. This paper shows different tools for RPA and how they can be used to solve some challenges that businesses are facing. We describe how RPA could be used in various application areas, and also we present several case studies.

Keywords—*robotic process automation, business processes, business process automation.*

I. INTRODUCTION

The global economy today is driven by new emerging technologies that are satisfying the new needs and demands set by the customers. Companies nowadays are looking for new ways to be more efficient, competitive, save costs, and be more agile, so they use their maximum and deliver the best value. One of the emerging technologies that is placed as a solution to this challenge is robotic process automation (RPA).

RPA is replacing the repetitive tasks done by the employees, leaving them a place to work on more complicated tasks that can bring better performance to the organization. RPA software can automate some simple tasks such as online transactions, but also can simplify more complicated tasks. The main aim is to improve the overall operations of the business, lower the operations costs and bring value to the organization. There have been successfully implemented processes in different projects in banking, customer service, finance, digital services and commerce [1]. Different reports are showing a very positive impact that RPA is having in decreasing the operational costs from 30% to 50% [2]. RPA can be extended with artificial intelligence, text mining or natural language processing, and it can help in forecasting scenarios and improving the operational and business processes.

There are different techniques for automation processes that have been used so the efficiency in the companies has been increasing through the years [3]. Customer software is one of them, precisely custom-made software for performing repetitive tasks has helped companies to increase their effectiveness. Runbooks are used for sets of tasks and IT based operations, and they can be used offline as well. Batches are commands that can be run with a single click. Batch can be even scheduled so it can run at specific times.

Wrappers are watchdogs of the host client applications, and they can validate a mainframe of applications with the help of a hummingbird. There is a browser and desktop automation, so the website can be saved to a database. The data and web service integration are a process where the reading and writing into the client database is done directly.

In this paper, we give an overview of the area of RPA. Different tools for RPA are presented, as well as the capabilities that they have. We give evidence about the advantages of using RPA. Also, we give details on how RPA could be used in various areas, along with the types of problems that could be solved in these areas. Several case studies are also presented that show how RPA is used in different companies.

The rest of this paper is organized in the following manner. In section 2 we define what RPA is, while section 3 gives an overview of several existing tools for RPA. Section 4 highlights the advantages that could be earned using RPA. Section 5 shows how various areas and business processes that occur in the companies from these areas could gain benefit from RPA, and in section 6 we present several case studies. Finally, section 7 concludes the paper.

II. ROBOTIC PROCESS AUTOMATION

RPA can be defined as tools that perform operations connected with user interface in a way that people can do it. The information system does not have any changes, rather RPA is concentrated on the interactions with user interfaces and their connection with APIs to the client services. The process is mapped in the RPA tools, so software robots can follow and execute the scripts (can be referred to as "bots") [4]. The bots can mimic or emulate certain or business processes such as manipulation of data, exchanging data, answering predefined questions etc. [5].

RPA process is done with the help of artificial intelligence employees and the automation services, where the variables are set up by the developer. RPA is using software that can do human activities, interact with different applications and implement rule-based tasks.

RPA is not a traditional method, and it is not part of the information structure, rather it is on the top. Through RPA, different actions can be completed, even complicated ones such as decision-making that is usually based on data and predefined objectives. There is an opportunity to use state activity that consists of three transition sectors such as trigger, condition and action, which are giving you the opportunity to set up a trigger or a new condition for the next state. This is a huge advantage that RPA is allowing to the users. Also, the RPA platforms have a trained software robot that is using the instructions, and even a person with little programming experience can be responsible for automating a simple or complex process with proper training [3].

III. TOOLS FOR ROBOTIC PROCESS AUTOMATION

In the past years, artificial intelligence and machine learning approaches have been stimulating the process of dealing more efficiently with data, reflecting different approaches such as statistics, business cases, automatic discovery, data transformations etc. We can make extractions from information by identifying patterns, grouping, optimizing, predicting, and categorizing, but there are a lot of challenges that are arising nowadays [6]. Studies done by Deloitte [7] are suggesting that AI algorithms should be implemented in strategic processes such as reducing fraud, optimizing routine procedures, improving customer satisfaction, procedures defined by the government and other processes, which can be considered as stable and mature ones. Since there are a lot of potentials and confrontations of the automation processes, we will present some of the open-source tools that are implemented with RPA, as well as AI techniques or algorithms, and what you can expect from each of them.

UiPath [8] is a platform that consists of three modules UiPath Studio, UiPath Robot and UiPath Orchestrator, and it allows the users to create and execute programming scripts with an option for customized plug-ins for business processes. UiPath Studio can help users in transferring and managing packages, executing flows, storage of records that are linked with Microsoft's Information Services Server and SQL Server, as well as with Elasticsearch, which is an open-source search engine. There is a Kibana data visualization plugin, which is mainly oriented towards analytics. This software standouts with many advantages such as recognition, classifications, optimization, extracting information with the usage of images or character recognition [9].

Automation Anywhere [10] is a tool that is oriented towards artificial intelligence algorithms, providing information about how AI techniques can be implemented and is applicable in areas such as CRM, supply chain, HR etc. Automation Anywhere can be connected to SAP and Oracle, but there is an opportunity to connect it with other software as well. The most used process is "Digital Workers", which allows incorporation of cognitive automation and analytical data analysis tools with different functionalities in the configuration, operation and implementation process with fuzzy logic and other AI tools in order to extract information with efficiency in document validation. Automation Anywhere has an IQ Bot platform [11].

Kofax [12] is offering automation services that are oriented towards data analyses and document recognition (through Optical Character Recognition - OCR processes). This tool can extract the data from different sources such as email, files etc. into various formats, so it can optimize the tasks with ERP and allows the flows between the different applications. This application can classify and recognize the data content, as well as analyze and validate the content. Furthermore, reaching the full potential of Kofax, clients can manage, monitor and deploy different processes. Having good analytics is also an important segment with unsupervised analyses through Cognitive Document Automation module, Automation platform and information clustering [13].

IBM is combining RPA and AI so it can unlock new levels of automation processes by extending in areas where it has not been used for automation and increasing the yield of robotics. IBM is offering an automation process strategy and design that includes a virtual workspace, 30000 cognitive consultants, and setting up an automation center for implementation. There is an option for implementing control methodologies, so a systematic approach for automation programs can be on the highest level. IBM is implementing analytics techniques for extracting data and performing statistical analyses so it can discover and identify relationships, test correlations in order to enable the most effective root cause analyses. IBM is using Watson Analytics so it can discover sustainable improvements, new opportunities, and increased performance. On the other hand, IBM can make correcting actions and find the error within a robot data log, and in this way it can improve the processing by 50%. IBM is offering an option to the clients, so they can connect with Automation Anywhere and other well-ranked providers as well [2].

IV. ADVANTAGES OF ROBOTIC PROCESS AUTOMATION

There are many advantages that RPA is gaining on its side and many of them are attracting companies to implement this process [14]. One of the most important segments for companies is data security [15]. We are facing a lot of data leaks in the security systems and on the other hand, we have strict data regulations [16], so selecting a well-maintained solution is contributing to the confidence in the company [17].

RPA is processing faster since there is no human factor involved, so customer satisfaction levels in some cases are getting on a higher scale. We can expect better feedback from customers and increased trust and loyalty [18].

There are a lot of ways to handle the metrics from the company, but the RPA system can continuously track the activities since the system is automated and even the smallest improvement can be tracked. These metrics are precise, and even though the process can become more complex, the RPA system can grow in a more intelligent way.

On the other hand, it is easier to track the errors made in RPA since the process is automated and it points out and detects the errors easier. Each of the steps is followed and recorded so removing the mistake is easier.

The RPA process is helping with improved analytics and the completed time can be even faster. All data have tags and metadata, so it is easier for better insights. On the other hand, there are reduced costs, and it is said that one robot can handle the work of at least three humans and can work 24 hours [19]. This PRA process is making better performance, increased productivity, better decision-making and multitasking results that are of high quality [3].

V. APPLICATION IN DIFFERENT AREAS

The RPA processes are applicable in many areas, and they can solve different problems that have risen for the companies. Besides some commonly used RPA cases, there are a lot of business departments and industries that can have an implementation of RPA practices. When we are speaking about sales, RPA can offer test cases with creating and delivering invoices since the records are updated and the invoices can be delivered [20]. CRM system can be also updated and the channel for communication with the

customers can be constantly corrected. Also, the linkage between HR department and CRM can help in tracking the progress of the employees in sales. Automation of sales is helping the companies to spend more time on building the relations with the customers and making bigger sales rather than spending time on operational activities.

RPA techniques can also be implemented in the financial sphere [21]. Financial planning involves a lot of financial statements from different departments, so processing and merging are automated for some repetitive tasks. The bank statements can be easily automated as well, so the records can be reconciled and compared between company records and banks' spreadsheets. The reports are done for daily profit and lots are followed by companies such as trading businesses, and for them it is important to automate the preparation of the reports. The accuracy after automation has reduced the time by one third, from 60 minutes to 20 minutes that is important for companies in financial industries. Despite the fact that loan processing is complex business logic, it can be automated, especially the decision of who is getting an approval for a loan. Account closure on the other hand is also a time-consuming process and it can be automated with an electronic form that covers all required tasks, but without manual intervention.

The insurance process is a crucial segment when it comes to processing a claim [22]. The customer experience with claims can be unpleasant and time consuming. The customers are also not able to follow the process of their claims and get an update. RPA bots can deal with these issues with predefined rules, so various data and changes can be easily made. The appeals process can be also automated with 99% accuracy, which is a high percentage.

Healthcare is an important service that can be easily automated via bots for appointments, doctors' availability, financial statements, and insurance information [23]. RPA can be used for patient records, billing and claim management where data input, processing and evaluation are taking place [24]. RPA combined with other technologies like image recognition can be used for data extraction of imputing telecopying images into transactional systems [25].

Manufacturing is a rising industry, so automating different tasks can lead to reduced mistakes, increased production cycle and better customer satisfaction [26]. The inventory control in retail can help the companies to get a warning when the stock is low, and if this process is automated there won't be any chain or production loss. On the other hand, the customer service department needs logistic support for delivery. RPA automated bots can track when delivery occurs, and it can improve the response time. The linkage between the warehouse and delivery to the final destination can be automated and reported in the system in a manner of time.

VI. CASE STUDIES

We need to highlight that the successful stories of RPA implementation are even for companies that are worldwide known. The RPA techniques, designs and proper implementation have helped businesses in different areas.

Dell Technologies is a company that builds a digital future all over the world, transforming the IT segment and creating technologies that are delivered across 180 countries. The company has over 10.500 employees, which is big

human capital that requires a lot of management. Dell's HR processes have been high volume of repetitive tasks, so RPA has helped Dell in improving its cost-effectiveness [27]. The company has removed some processes such as notification or status updates, on-boarding process reminders and recruiter assignments, and it made HR employees freer in this segment. The RPA process in Dell has helped the HR department to focus more on personal interactions. Dell is one of the first companies that has implemented bots for HR. There was a pilot program that enabled the employees to have a hands-on experience while building and using the bots. So far, Dell has automated the following processes: Open requisition recruiter assignments, Offer status management, On-boarding progress reminders, Concur expense error reports, Talent Acquisition (TA) Leadership Team Reporting, Learning and Development reports and communications, Quarterly Performance and Compensation Review (PCR) letters, Employee travel invitation letters, and Job reference letters.

Another successful example of RPA is Coke Canada Bottling [28]. This company has created immediate values by automating the processes and it gained a strategic competitive advantage. The proof of concept was created in 48 hours and the results were outstanding. RPA has helped Coke Canada Bottling to deliver a value in 6 weeks, rather than waiting years for the new integration. In this case, RPA was standing as an immediate solution, which is a big advantage and step forward. Coke Canada Bottling's Intelligent Automation team was building bots, called digital workers. Digital workers were implementing RPA in uploading forms related to equipment orders for the Environmental Protection Agency, automating product sampling requests that were tracked for the accounting department. As an outcome of RPA, Coke Canada Bottling has saved 7.500 hours per month, all the solutions that are implemented have quick deployment and resolve in a shorter time.

Uber is another successful company that has implemented automation processes, so it had the chance to experience the growth and advantages of this digital transformation [29]. Uber is growing daily, so it is difficult to track the changes and coordinate global operations. Uber was in a need of automation in the operation processes in order to keep the track of them. One of the other challenges for Uber was managing the costs and hiring people. RPA has helped Uber to develop advanced solutions, to increase employees' satisfaction and processes to be inline with company's standards. Uber is having more than 100 processes, which makes Uber savings for about \$10 million per year. Uber has reduced errors that were made in their systems and has over 70% of invoices done through the automation system. Customers' satisfaction has increased due to the main portals that Uber has built, and team members can concentrate more on problem-solving.

VII. CONCLUSION

This paper gives an overview of RPA processes, their relations with artificial intelligence, and a set of tools such as Kofax, UiPath, IBM (Watson Analytics) and Automation Anywhere, which are part of RPA features. The integration of these tools is essential for better optimization, efficiency, extraction of data, presenting information to the customers, classifications and analytics. We also presented how RPA can be used for solving different problems in various areas.

Also, several case studies from particular companies are presented.

The combination of artificial intelligence, statistical methods, text mining, fuzzy logic, intelligent automation and devices are bringing another era of digital processes that are improving the RPA processes, and we can reach today another level of automation that has never been implemented before. The RPA concepts together with artificial intelligence techniques are essential for the companies that want to bring the automation processes on their agenda and increase companies' efficiency and profit.

RPA automation is beneficial since saves time, money, and resources. The technology is helping people to do more valuable work, improving the accuracy of work and making emphasizing of more complicated tasks. RPA is improving the data insights and it is increasing customers' and employees' satisfaction. The stimulating experience that RPA is creating, it is helping to the development capabilities and it is making an impact all over the business segments. RPA will contribute to even bigger efficiency in the future as we all expect that the technology will revolutionize even more.

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