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# Overview on Robotic Process Automation

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**ABSTRACT:** Taking into account the technological evolution of the last decades and the proliferation of information systems in society, today we see the vast majority of services provided by companies and institutions as digital services. Industry 4.0 is the fourth industrial revolution where technologies and automation are asserting themselves as major changes. Robotic Process Automation (RPA) has numerous advantages in terms of automating organizational and business processes.

Drawing inspiration from the symbiotic relationship between humans and machines, this abstract explores how RPA serves not only as a tool for streamlining repetitive tasks but also as a catalyst for unleashing human creativity. By offloading mundane tasks to digital counterparts, RPA liberates human capacity for strategic thinking, problem-solving, and innovation, thus fostering a culture of creativity within organizations.

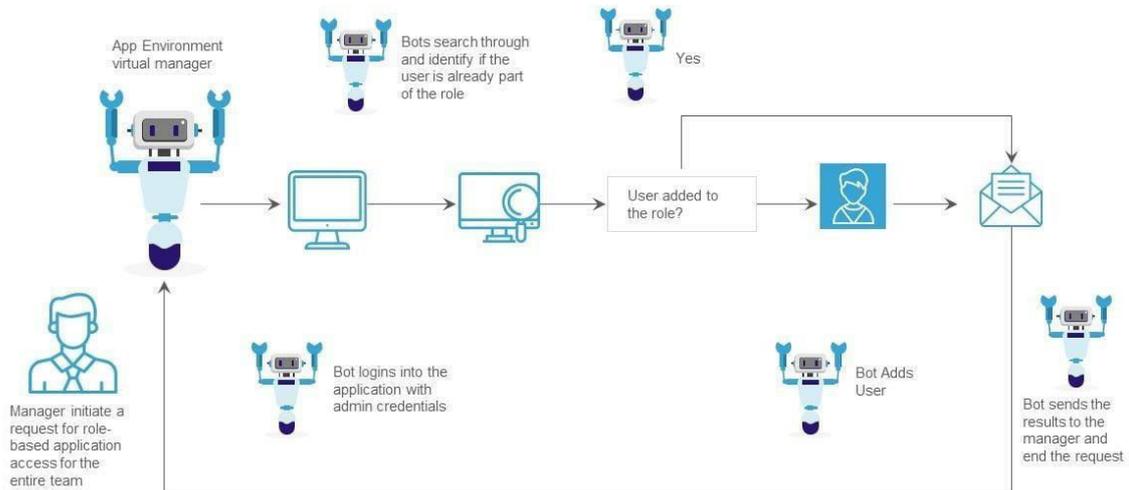
**KEYWORDS:** Robotic Process Automation, Artificial Intelligence, Industry 4.0, Intelligent Process Automation.

## I. INTRODUCTION

The availability of digital services is seen as a growing trend at a company-level, taking into account the greater use of the proliferation of information systems in society and the technological revolution that we are witnessing at various levels. The form of communication between citizens, companies and institutions started to be mostly through the exchange of digital information. In view of the high volume of information and digital documentation exchanged between entities, in general, it is humanly impossible to respond in a timely manner to the processing of all information and to follow up on processes internally. In this sense, we highlight the importance of Robotic Process Automation (RPA), which can be defined as a “technique that results in the automatic execution of administrative, scientific or industrial tasks” [1] which uses robotics as a “set of techniques concerning the operation and use of automata (robots) in the execution of multiple tasks in place of man” [1] for “how to do a thing; standard; method; system” [1]. In this context and in a nutshell, the RPA tools correspond to a set of techniques that aim to improve the work by reducing the number of repetitive tasks, automating them [2]. In addition to the use of RPA, the complement with Artificial Intelligence (AI) - algorithms and techniques - allows to improve the precision of the execution of automated processes. Industry 4.0 reviews a set of technologies and sensors that allows an even greater advance in the processes and applications of automation of AI applications for organizational processes, contributing to a better performance and presenting new opportunities. The main contribution of this paper is essentially in providing a review of AI and RPA contributions to Industry 4.0 as well as in the analysis and comparison of several proprietary and open source tools regarding their functionalities. This document is structured as follows. In chapter two the general concept about Robotic Process Automation is presented and in section 3 the general concept of Artificial Intelligence and Industry 4.0. In chapter 4, several proprietary and open source tools are presented and their main characteristics so that in chapter 5 a discussion about the tools is made. In chapter 6 the conclusions are presented and then the references that support this work are presented.

## Tasks Performed by Robotic Process Automation

This slide depicts the daily tasks performed by the robotic automation process and how RPA performs these tasks efficiently, instantly and error-free.



This slide is 100% editable. Adapt it to your needs and capture your audience's attention.

Robotic Process Automation (RPA) is the automation of services tasks that reproduce the work that humans do [3]. The automation is done with the help of software robots or AI workers that are able to perform, accurately, repetitive tasks. The task instructions are set by the developer using some form of screen recording and defining variables. These tasks include actions like logging into applications, copying and pasting data, opening emails, filling forms, among others [4]. Van der Aalst et al. [3] state that “RPA is an umbrella term for tools that operate on the user interface of other computer systems”. Although traditional forms of process automation (like screen recording, scraping and macros) also rely on the computer’s user interface, RPA’s core function is via element identification and not by screen coordinates [4] or XPath selections. This, in most cases, provides a more intelligent interaction with the user interface. Commercial vendors of RPA tools report a surge in demand since 2016 [3], and we see some research where these tools are used for automating digital forensics [4], auditing [5] and industry [6]. The advent of the fourth industrial revolution (Industry 4.0) is paving the way for new ways to automate mundane rules-based business processes, using RPA tools on information obtained from smart devices [6]. For business processes, RPA is the extrapolation of a human worker’s repetitive tasks by a robot (where those tasks are done quickly and profitably). This aims to replace people by automation in an outside-in manner. Unlike traditional methods, RPA is not part of the information infrastructure but rather sits on top of it, implying a low level of intrusiveness [7] possibly reducing costs. Some reports present a 30% to 50% decrease in operational costs of transactional activities within shared services with the use of RPA technologies [8].

## II. METHODOLOGY

Robotic process automation tools can automate a lot of user routines in a business process. Thus, which user routines in an organization can be favorably automated with RPA? To answer this question, a class of tools called RPM (Robotic Process Mining Tools) tools has been envisioned in the work RPM has been defined as a class of methods and tools that will be used to analyze data obtained during the execution of user-driven tasks. The goal of RPM is to support the determination of candidate user processes that can be automated by RPA robots. In the same context, this section explains the approach we propose for selecting candidate routines/tasks to be automated with robotic process automation tools. In the next section, the application of the approach with a use case is explained. Since RPA is dedicated to automating manual and repetitive tasks operated on the user interface level, one can record the execution of all tasks and all the interactions between user interfaces. From the record, a UI log can be generated. The UI log shall contain user-driven tasks that involve interactions between a user and software applications. This latter can be used then as input by process mining techniques to discover routines. From the discovered model, candidate tasks for automation using RPA can be selected. Therefore, the proposed approach is composed of four steps: user interface (UI)

log generation, Ut log transformation into a log supported by process mining techniques, routines discovery with process mining, and candidate tasks selection based on specific criteria.

### **Gather**

Capturing the processes is the most critical activity prior to beginning the automation journey for any organization. It is vital to have at least three groups of SMEs to collaborate at this stage. A) Domain Experts (because they understand the nitty-gritty of the industry), B) Process Experts (because they know the process in and out from the improvisation perspective), and C) Operational Experts (because they deliver these processes on the ground). The more details we can capture, the better the end process can be shaped and of course, be more beneficial when it comes to ROI implications.

The objectives at this stage are to capture and discover the customer journey (not just the process), create an inventory of all processes to enable a knowledge bank in one-go/collate existing knowledge, and capture undocumented processes (end-to-end) and its volumetric details.

### **Analyze**

As the name suggests, the analyze stage involves a core team to microscopically detail out the information collated in the previous stage. At this stage, we recommend involving automation consultants in addition to the SME group introduced at the first stage. The core team would ideally weed out the steps that do not add any value to the business processes through Lean and Six Sigma initiatives. Next step would be to identify process steps that can be harmonized or need to be re-engineered to create the perfect process. A high-level project plan is created and tollgates for all transformation opportunities are identified.

The objectives at this stage are to analyze the processes for simplification and reengineering, selection of processes right for RPA deployment, high-level business case development of such processes, and identification of processes that require artificial intelligence-based support.

### **Design**

In this phase, detailed due diligence is conducted for the identified processes. The core team from stage two will continue to support and complete the overall value stream mapping of the As-Is process flow to design the efficient To-Be workflow with minimum possible manual efforts and maximum automation opportunity. Important steps include creating a detailed Level 6 keystroke level map to identify the exact steps that can be automated, and perform gap analysis to identify any leakage in the process flows and benchmark against best-in-class industry standards.

All these steps help the team design the To-Be state of truly digital automated processes with a business case clearly articulating the ROI with timelines. The project manager documents and floats a detailed project plan with mutually agreed (between client-vendor) timelines in order to assign responsibilities as per the RACI matrix. Documentation and creation of artefacts, which can be used and re-used for later purposes, is necessary at this stage.

The objectives at this stage are to create the keystroke level To-Be maps, business case, and detailed project plan with clearly called-out responsibilities.

### **Execute**

The team at this stage expands with inclusion of developers, technical architects, testers, apart from the process consultants, domain SMEs and operational SMEs. Multiple batches of this team structure are created in case there are multiple processes at the start of the execution phase. During the execution stage, the team can decide to utilize Agile, DevOps or a mix of both methodologies for deployment. Organizations today are exploring hybrid methodology in order to accelerate software delivery and increase collaboration amongst development, assurance, and operations teams. Core team then divides the implementation process in sprints and executes these sprints according to the agreed project plan. Typically, Sprint 1 will include requirement gathering, feasibility and creation of project plan with sprints delivery timelines, and Sprint 2 includes incremental development done and released for testing. Every sprint will include development until a logical point, and show and tell sessions for complex processes and

incremental releases for testing. The ensuing sprint fixes the bugs identified during testing. The testing team utilizes a strong testing process (unit, box, regression, etc.) with a parallel run methodology before bots go live to enable 100% quality check and then hand over to operations team for utilization.

### Improvise

Several organizations tend to miss this stage by providing a simplistic maintenance/support team that caters to the bots deployed in the previous stage.

The right team at this stage include the support staff and process consultants for utilizing the actionable insights generated from the plethora of information/data collected from the earlier four stages. The information allows us to not only monitor and assess the actual utilization of bots in the automated processes but also enables us to identify the exception/fallout scenarios. It also helps create operational reports and dashboards for management review, and provide predictive insights for processes that can be made smarter eventually. A smarter organization would do well to invest in a strong support mechanism and structure in order to support the change management process and alignment with larger goals of automation strategy.

The objectives at this stage are to create a strong support team with clear levels/priorities/ escalation matrix, creation of operational dashboards and actionable insights for process enhancement.

### Accelerated Future

RPA has been instrumental in revolutionizing existing processes to increase speed to market, eliminate waste, reduce errors and enhance customer experience. The future will see tremendous growth in RPA with the passage of machine learning and artificial intelligence accelerating. Eventoday, advancements in automation like cognitive automation help us in various ways - from investigating critical issues of dipping customer satisfaction ratings, reducing IT helpdesk tickets and issue resolutions, to HR initiatives of reducing attrition. We have already seen multiple applications of cognitive automation in our lives – from medicine to sports. It is only a matter of time for smarter cognitive automation to be an integral part of our daily lives in some shape (Alexa, Cortana, Google Assistant, etc.).

Traditional RPA automates rule-based, repetitive, high transactions-based processes, and thus, it is vital that the deployment approach an organization deploys is robust and efficient to ensure maximum benefits.

## III. CONCLUSION

This document presents an investigation on RPA with AI for ERP-related processes. It was based on the analysis of information researched in digital libraries on the web (corporate websites and tools, blogs, etc.), as well as in scientific digital libraries. A set of proprietary tools (UiPath, Kofax, Automation Anywhere and Win Automation) and Open source tools (Assist Edge and Automagica) were identified, and for each of them a characterization of their RPA features, their integration with ERPs and support for ERPs was made. We conclude that most of the proprietary tools implement algorithms associated with the objectives of AI, such as recognition, optimization, classification and extraction of knowledge from either RPA documents or processes. It also enhances their optimization and exploration of the information by the users of these applications. The AI techniques and algorithms that these tools implement, focus on computer vision (image recognition using for example Artificial Neural Networks), statistical methods, decision trees, neural networks for classification and prediction, fuzzy logic and implementation of techniques associated with text mining, natural language processing and recommendation systems.

RPA's ability to automate repetitive tasks liberates human potential, enabling individuals to focus on higher-order activities that demand creativity, critical thinking, and emotional intelligence. By fostering a culture of innovation, RPA empowers organizations to stay agile, adapt to dynamic market conditions, and drive sustainable growth. Moreover, RPA serves as a catalyst for workforce augmentation, amplifying the capabilities of human workers rather than displacing them. Through skill enrichment and task empowerment, RPA elevates job roles, enhances job satisfaction, and fosters a more engaged workforce. However, the ethical dimension of RPA deployment cannot be overlooked. Responsible automation practices are essential to ensure that RPA initiatives prioritize transparency, accountability, and inclusivity. By adhering to ethical guidelines, organizations can mitigate the risk of unintended consequences and uphold human dignity in the digital age. In essence, the journey of RPA transcends the boundaries of conventional efficiency enhancement. It represents a holistic approach towards organizational transformation, where technology and

humanity converge to unlock new possibilities for innovation, growth, and sustainable development. As we continue to navigate the complexities of the digital era, embracing RPA with a vision of human-centricity and ethical stewardship will pave the way for a brighter, more inclusive future.

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