BCI in Robotic Process Automation

[1] Silpa S, [2]Dr. Anjana S Chandran,
[1] Student, [2]Assistant Professor,
[1] Department of Master of Computer Applications,
[1] SCMS School of Technology and Management, Cochin, India

Abstract: Robotic process automation (or RPA) is an emerging form of clerical process automation technology based on the notion of software robots or artificial intelligence (AI) workers. RPA is a set of concepts and technologies designed to intelligently automate repetitive business, industrial, and other tasks. By using Brain Computer Interface with RPA, it is possible to monitor software robots without much human intervention in less time. A brain-computer interface (BCI) is a technology that allows communication between a human or animal brain and an external technology. This term can refer to an interface that takes signals from the brain to an external piece of hardware, or a technology that sends signals to the brain. Thus we could improve RPA in a most effective way possible.

IndexTerms **- Robotic Process Automation, Artificial Intelligence, Brain Computer Interface**

I. INTRODUCTION

RPA is any capability (software and services) that allows you to transact in any IT application or website, typically in the same way a human would, to automate complex, rule-based work. In other words, RPA software allows developers to tailor complex automations to a company's processes. When an RPA robot is at work, it performs tasks just like a human would: logging in, operating applications, entering data, performing complex calculations and logging out.

Because RPA is software-based, it can be used to perform various tasks. These include maintenance of records, queries, calculations, and transactions. Additionally, any application commonly used by your company can be operated by RPA. For example, Citrix, .NET, HTML, and Java are all technologies commonly supported by RPA. Compatible systems include Mainframe Terminals, SAP, Oracle, Backline, and many more. Programmable automation means that RPA can be configured to perform almost any rule-based task.[1]

Robotic Process Automation delivers direct profitability while improving accuracy across organizations and industries. Designed to perform on a vast range of repetitive tasks, software robots interpret, trigger responses and communicate with other systems just like humans do. Only substantially better: a robot never sleeps, makes zero mistakes and costs a lot less than an employee.[2]

II. WORKING TECHNOLOGY

Robotic process automation products broadly comprise three fundamental elements: a set of developer tools, a robot controller, and the software robots.

The developer tools are used to define jobs—the sequence of step- by-step instructions a robot follows to perform a particular business process. The instructions, which need to be very detailed, may include business rules or conditional logic, such as if/then decisions. Developer tools often feature drag-and-drop functionality and simple configuration wizards so that business users without coding experience can employ them. However, these tools are not as simple as writing "macros" and do require users to focus on spotting exceptions, which may impede the automated process if not addressed up front. Some tools include a "process recorder" that speeds up the definition of a process by capturing a sequence of user actions. Others feature interactive diagrams that make visualizing complex processes easier. Developer tools are used only in modeling the processes and making changes to them; they are not required to actually run the processes.

The robot controller plays three essential roles. By serving as a master repository for defined jobs, the robot controller facilitates version control. It safely stores credentials for business applications and provides them to robots only when required, ideally in encrypted form. The robot controller also assigns appropriate roles and permissions to users, and provides controls and workflows to govern the processes of creating, updating, testing, reviewing, approving, and deploying jobs to the robot workforce. Finally, it assigns jobs to single or grouped robots, and monitors and reports on their activities.

Software robots (also known as "clients" or "agents") carry out instructions and interact directly with business applications to process transactions. The list of actions a robot is capable of performing can stretch to over 600 in some products[3], and additional actions can

often be custom-coded. Some robots keep detailed logs of their actions and decisions for compliance and audit purposes, as well as to help companies identify additional process improvement opportunities.[3]

III. APPLICATION AND ADVANTAGES

Utilities: Utility companies – gas, electric, water, etc. – deal with monetary transactions every day, so an obvious opportunity for RPA would be in billing. But as Genfour points out, RPA could also make a significant impact on meter-reading exceptions, debt recovery, and customer service. By automating a number of troubleshooting robots, a utility company can lower the number of failed meter-readings that need human attention. And of course, plenty of other industries could benefit from streamlined debt recovery and customer service as well.[2]

Legal: The legal system is practically built on paper, and although making a switch to RPA requires more legwork than the average for-profit business, RPA could truly revolutionize the legal system. A software robot can scan through the massive stack of documents needed for a single legal case in seconds, and the analytics RPA provides could even unearth missed information. Admittedly, this would require a full digitization of all paper documents to be really successful. An enormous undertaking, to be sure, but one with significant gains through RPA. [2]

Insurance: The insurance business combines the aspects of high volume of transactions and lots of paperwork – perfect for RPA! However, the flow of transactions or claims may not be as steady as it is for a utility company. One top insurance company was drawn to RPA for its ability to be easily scaled up or down on a daily or hourly basis. You may need fewer robots working in the afternoon than in the morning, and RPA can be altered to fit your needs. [2]

Banking: While there's already a fair share of automation going on in banks, remember that the key factor of RPA is its ability to work with and across legacy systems. Banking institutions can be weighed down by lots and lots of independent databases, which then require lots of database administrators to support them all. RPA can dramatically cut costs by eliminating the need for so many database administrators. Banks have also used tiered systems of RPA to solve failed transactions without human involvement. [2]

Cost Savings: One of the biggest advantages of robotic process automation is the immediate and significant reduction in expenditure it can deliver. When work is automated, not only is it completed faster, but it also can be performed round-the-clock at a much lower rate. So, you get greater output for less, which results in a better bottom-line. [2]

Quality, Accurate Work: Even the most careful human can and will make a mistake. Multiply those errors by the number of people you have performing routine tasks for your company, and you could be looking at a pretty costly problem. With RPA, the work is performed error-free. Better quality means higher satisfaction rates, which – again is good for your company's profitability. [2]

Employee Empowerment: Robotic process automation does not require any special technical skills. That's why it's an ideal application for the end-user. The ability to deploy robots to perform certain tasks without having to enlist the help of someone from IT empowers the end-user to get their jobs done more efficiently and effectively. Meanwhile, it frees up IT to focus on more important tasks and projects. [2]

Better Control: Many companies choose to outsource so-called busy work to external parties. This, of course, comes with inherent risk. Robotic process automation can provide a better solution and since the work remains in-house, the business maintains maximum possession, control and visibility. [2]

Simplicity and Flexibility: Automating tasks and workflows through RPA does not require coding or script writing. That means even complex processes can be transferred from human to machine with little effort. The faster these tasks and workflows can be automated, the sooner your organization will begin reaping the benefits. In other words, RPA delivers quick returns. [2]

IV. DISADVANTAGES

Technology limits. Current technology is unable to automate all desired tasks. Some tasks cannot be easily automated, such as the production or assembly of products with inconsistent component sizes or in tasks where manual dexterity is required. There are some things that are best left to human assembly and manipulation.[5]

Economic limits. Certain tasks would cost more to automate than to perform manually. Automation is typically best suited to processes that are repeatable, consistent and high volume. [5]

Unpredictable development costs. The research and development cost of automating a process is difficult to predict accurately beforehand. Since this cost can have a large impact on profitability, it is possible to finish automating a process only to discover that there is no economic advantage in doing so. With the advent and continued growth of different types of production lines, however, more accurate estimates based on previous projects can be made. [5]

Initial costs are relatively high. The automation of a new product or the construction of a new plant requires a huge initial investment compared to the unit cost of the product. Even machinery for which the development cost has already been recovered is expensive in terms of hardware and labor. The cost can be prohibitive for custom production lines where product handling and tooling must be developed. [5]

A skilled maintenance department is often required to service and maintain the automation system in proper working order. Failure to maintain the automation system will ultimately result in lost production and/or bad parts being produced. [5]

V. CHALLENGES

However, as with any technology solution, software robots are prone to their own sources of failure. For instance, if an error creeps into the instructions provided to the software robots, they will then execute a flawed process and potentially replicate it hundreds or thousands of times until someone spots the problem. Sound process design up front can prevent such a scenario.

Also, if an organization rolls out RPA on a large scale, deliberate and systematic governance of robotic processes is critical to confirm that they are indeed executing per design and that any interdependencies with other robotic or manual processes are taken into account.[3]

Both is limited to the speed of the application. Tasks that require judgments and creativity cannot be automated. Even minor changes to the applications will need the robots to be reconfigured. .[6]

VI. PROPOSED SOLUTIONS

By making autonomous error recovery an attribute of the robot programming and control system, we can improve the reliability of robots and at the same time simplify the programming task. The manufacturing engineer can concentrate on describing the task at hand without having to consider all likely errors and how to correct them.[6]

A new brain-computer interface developed by scientists can read a person's thoughts in real time to identify when a robot makes a mistake, an advance that may lead to safer self driving cars. Brain-computer interface (BCI) is collaboration between a brain and a device that enables signals from the brain to direct some external activity. The interface enables a direct communications pathway between the brain and the object to be controlled.Most existing brain-computer interface (BCI) require people to train with it and even learn to modulate their thoughts to help the machine understand, researchers said.By relying on brain signals called "error-related potentials" (ErrPs) that occur automatically when humans make a mistake or spot someone else making one, the new approach allows even complete novices to control a robot with their minds.[9]

The reason a BCI works at all is because of the way our brains function. Our brains are filled with **neurons**, individual nerve cells connected to one another by dendrites and axons. Every time we think, move, feel or remember something, our neurons are at work. That work is carried out by small electric signals that zip from neuron to neuron as fast as 250 mph. The signals are generated by differences in electric potential carried by ions on the membrane of each neuron.[10]

VII. ADVATAGES OF PROPOSED SYSTEM

1. BCIs can facilitate hands-free applications bringing the ease and comfort to human beings through mind-controlling of machines.
2. With BCI, human can interrupt the software once it is doing something wrong.

3. Though BCI needs human attention to system, since it is doing repetitive tasks only need to verify at the beginning of execution.
4. BCIs reduce the lag between deciding to move the mouse...moving it...and the cursor actually moving. The lag is small but makes all the difference to some time-sensitive applications.

VIII. DISADVATAGES OF PROPOSED SYSTEM

1. While using BCI, we cannot prevent the error from occurring, but can stop it once it happens.
2. Software robots are meant to do tasks without human intervention, but while error occurs it needs human attention.
3. Research in to BCIs at the moment is at a fairly basic level considering the complexity of the problem.
4. BCIs are currently fairly inaccurate in terms of classifying neural activity.
5. BCIs placed outside of the skull have a limited ability to read brain signals.
6. They can be placed under the skull, but this requires pretty drastic surgery.

IX. CONCLUSION

While RPA is a boon to IT services industry considering the positive impact in terms of cost, profitability and operational efficiency, the concern about downsizing of labor could be tackled by way of reallocation and redistribution of human capital. If an organization rolls out RPA on a large scale, deliberate and systematic governance of robotic processes is critical to confirm that they are indeed executing per design. It can make millions of errors within fraction of second. To make this situation easy, we can implement brain-computer interface in RPA. With this, we can control the software robot once an error is found. BCIs can facilitate hands-free applications bringing the ease and comfort to human beings through mind-controlling of machines. Though BCI needs human attention to system, since it is doing repetitive tasks only need to verify at the beginning of execution. Automation is here to stay and would continue to change the business model and delivery model of IT.

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