Robotic Process Automation through Process Mining

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Abstract: Robotic process automation, has revolutionized businesses and operations in the 21st century. This innovative technology makes automated tasks easier than ever before, allowing for faster processes and greater business efficiency. In an age that prizes convenience and speed, robotic process automation's success has been felt in a variety of industries including insurance, healthcare, banking, transportation, and more.

Robotic process automation combined with process mining is a game-changing approach to operational efficiency. Through this innovative combination, businesses are able to take advantage of their existing data in order to autonomously and rapidly identify opportunities for automation across their organizational processes. In addition, this allows companies to monitor the performance of the robotically automated processes, enabling them to quickly understand which processes are working and which could benefit from further optimization. With robotic process automation through process mining, companies have stream-lined their operations and enhanced customer experience in ways that were not possible just a few years ago.

In this paper we aim to highlight the benefits of the fusion of these two technologies, software robots development and process mining, oriented both on the actual implementation, configuration and the final results.

Key words: Robotic process automation, process mining, technology, innovation, business analysis.

JEL: O - Economic Development, Innovation, Technological Change, and Growth

1. Introduction – Process Mining

These days, we are surrounded by technology throughout the entire time, and sometimes we end up integrating it into almost every activity that constitutes a program as a daily habit. Process mining, a growing area of data science and research, promises to revolutionize the way that companies monitor and evaluate their business processes. By automating the discovery, analysis, and optimization of business process flows, process mining has the potential to drastically improve efficiency within businesses by granting better insights into where mistakes are occurring and providing methods for streamlining activities. By incorporating and monitoring transactional feedback from multiple sources in real-time, process mining can help managers identify bottlenecks more quickly, allowing them to make informed decisions quickly and with greater accuracy. As such, process mining is an impressive innovation that can greatly optimize performance while providing clearer visibility into large-scale operations.

Process mining is a rapidly growing field in data science that focuses on analyzing business processes from event logs. Its main target is represented by this innovative technique used to improve current process practices within an organization or institution. This technology can be applied to automated processes, manual processes, and even hybrid ones, providing powerful insights into areas such as compliance and risk reduction. With the rise of big data, process mining helps provide organizations with a reliable method of developing better operational quality in order to optimize processes, reduce costs, and make organizational structures more efficient.

It enables the user to identify deviations from the programmed processes and automatically create an audit trail in order to improve process performance and algorithms that analyze the patterns and pathways found in recorded information like time-stamp logs to give a clear understanding of complex processes.

In addition, process mining tools can detect similarities between certain tasks or activities that may have been previously unidentified, leading to improved efficiencies throughout the entire organization. This allows personnel to better comprehend the integral elements of the process in question, while also providing insights into any discrepancies between actual and planned activities. By using specialized techniques such as these events log analysis, model discovery and conformance checking, process improvements can be effectively detected and executed on an ambitious timeline. Beyond just optimizing processes based on historical records, process mining can also be used as an analytical tool to predict future events and enable smarter decision-making. Companies that invest in process mining are almost guaranteed to experience increased efficiency as well as better visibility across their entire operational landscape.

2. Literature review

Focusing on a specific technology, we tend to underline even its' reviews and the most important, customers' feedback. A result of a recent study, which is published on the official website of the UiPath vendor, shows that around 78% of people who aim to automate business flows, say that process mining is key to enabling targeted robotic process automation (RPA) efforts (UiPath, 2020). What can be more relevant than the feedback of customers who use the discussed implementations in their daily production environment? As highlighted in a recent article entitled "Customer experience: a conceptual overview", customer experience constitutes a multidimensional, complex, and context-based concept (Toma, Catană, 2021).

Also, in addition to the benefits directly brought by the configuration that is under observation, we can say that through the actual results obtained, we also receive the answer to the eternal question "What should be automated and what should be done by humans?" (Van der Aalst, Bichler and Heinzl, 2018), which was also highlighted in a relevant article entitled "Robotic Process Automation".

It is true that it is useful to use software robots with the aim of automating as many business flows as possible within a company, but in addition to the actual implementation that is handled by specialized developers, a part that represents the effective basis of the entire process is represented by business analysis. At this point, we are aware of the need for competent employees, who can master the targeted process and at the same time understand how software robots work and can be implemented, so that they can prepare documentation and analysis that will represent real support for developers. The truth is that it is difficult to train people who can take over business processes and transpose them from a technical perspective, since they do not have experience on the development side.

Given these reasons, process mining technology comes to the aid of the implementation of new automations, having reliable business perspective support.

Big companies like McKinsey and Co. mention in an article entitled "Four Fundamentals of Workplace Automation" that even "the highest-paid occupations in the economy, such as financial managers, physicians, and senior executives, including CEOs, have a significant amount of activity that can be automated." (Chui, Manyika and Miremadi, 2015). Therefore, being aware of the real demand that exists on the market to develop such automations, it is mandatory to judge step by step the key moments in such a configuration procedure.

Assessing a study from Everest Group, the target on which we focus our attention, UiPath, is confirmed that it represents the market leader targeting the technology we are talking about. As the main vendor of this technology, there is no doubt that it is the market leader in this niche. As an overview analysis of market adoption and capability, key performance factors were delimited as can be seen in Table 1.

Description	2021	YoY growth
Process mining clients (indi- vidual logos)	201	214%
Total FTEs (represents total employee base)	3,527	Not disclosed
Number of service provider partners / resellers	5,100	27%
Number of technology / soft- ware partners	500	Not disclosed
Key service provider part- ners/resellers	Ashling Partners, Capgemini, CGI, Cognizant, EY, Grupo Assa/Globant, PwC, and SYKES Digital Services	
Key technology / software partners	ABBY, Adobe, Alteryx, AWS, Box, Google, Microsoft, Oracle, Qlik, Salesforce, SAP	

Table 1: Process mining product profile – Market adoption and capability overview

Source: Everest Group, "Everest Group PEAK Matrix for Process Mining Technology Provider" – Focus on UiPath, (June, 2022)

After their assessment in 2022, UiPath is positioned as Star Performer and Leader in the market. They have also mentioned their capabilities from the perspective of offerings, market impact, strengths and limitations. From the point of hosting the effective product, Everest discovered that 90% of customers chose the on-premise and only 10% turned to cloud infrastructure. It is essential to take into account the opening of large companies that have the financial potential to purchase licenses related to the analyzed technologies as regardless of the context, truly big companies show that they are able to adapt to almost any given condition, managing even to thrive in challenging times (Grădinaru, Nica, Georgescu, 2021).

Another important detail is represented by the manner of splitting of the total full time equivalent (FTEs) by function, as Everest mentioned it "includes total company FTEs in product development, support services (product support, implementation, etc.), and sales & marketing; excludes FTEs in corporate functions such as HR and IT". The final results have outlined the percentages thus 15% for support services, 30% for product development and 55% in sales and marketing. They collected information about geographical positioning that accesses this technology, as follows 41% Continental Europe, 40% North America, 10% Asia-Pacific (APAC), 6% UK and only 3% for Latin-America (LATAM) (Everest Group, 2022). Their objective was to see what is the difference in vision and also the opening to the implementation of new technologies that dynamise the market and engage in competition in a process of evolution that can sometimes be forced by imposing new trends in the tech market.

A strategic approach of implementation in robotic process automation projects the process mining perspective should also take into consideration important key aspects. One of them are smart tags and key performance indicators (KPIs). When it comes to measuring success and total progress in software development, smart tags and KPIs have become increasingly important. Smart tags are labels that characterize the parts of a system or an application according to their special characteristics. On the other hand, KPIs are measurable indicators covering specific organizational objectives. These are extremely useful in tracking the progress of a software development project, helping identify where teams or individuals are falling short and enabling managers to adjust project plans accordingly. These two tools provide great insight into how various components interact and fit together in a component-based software development environment, allowing them to function as powerful methods for evaluation performance as well as ensuring overall development efficiency. Smart tags allow for increased visibility throughout the entire process and make it easier for operatives to track the success of specific tasks and stages. For example, a dashboard that is created with smart tags and KPIs can provide information about total workloads and compare that against completion rates. This information can help evaluate performance effectively, giving data-driven feedback on specific software developments.

As an advantage, having this objective view it is then possible to more realistically develop strategies, assign resources appropriately and overall have increased control over the project's progress. Furthermore, combining the two offers unique abilities to detect problems in a timely manner and improve communication between stakeholders along the software development process.

Event logs are a critical factor in the development of process mining. Initially, event logs list data events and other related information which can then be used to help identify and improve opportunities for efficiency within processes. This kind of log data helps to generate an understanding of processes in action and can be used to assess current performance metrics against necessary goals. Utilizing event logs allows researchers to create simulations which can be tested with different possible outcomes, pinpointing bottlenecks and inefficiencies, using available data models as a foundation. Thus, they form an integral part of the development process mining tools rely on in order to make successful improvements.

This inside which is the basis of the development of process mining technology, namely event logs related to the processes that are running, there are companies that not only want to put into practice the effective implementation of the tools available on the market at the moment, but also develop customized tools that customize according to your own needs or even those of possible future clients. A suitable example for this context is the product called "Action Logger" described in detail in the article "Action Logger: Enabling Process Mining for Robotic Process Automation" written by Leno et al. (2019). Therefore, as they wanted the process mining tool to meet certain functional requirements, they developed their own product to be in accordance with those requirements. The five big aspects that they took into account are represented by relevance, granularity, data-awareness, context-independence and last but not least, the interoperability.

Besides the key factors described previously, such as other applicability of similar technologies, the return of investment (ROI) indicator can represent a counterweight to an investment 12

balance. It is an important indicator in process mining implementations as it helps quantify the impact of the implementation on a business. Process mining can produce rich and actionable insights about how a business functions, but it only makes sense to invest in such technology if it can increase effectiveness and efficiency for the company. To make sure that a process mining implementation is likely to be successful, it's critical to consider return on investment indicators up front.

An important metric commonly used to judge the financial performance of a venture is the return of investment indicator, which can be calculated by subtracting all costs associated with the project from its total profits and then dividing this figure by the total cost. This identifying number can help investors evaluate potential investments and determine their profitability. Additionally, managerial staff should use this indicator to determine which projects are most likely to pay off, thus allowing them to make smarter research and development decisions. With an accurate ROI indicator, it is possible for an organization to more clearly assess its risks and returns, which allows them to allocate resources more effectively and maximize their profit margins.

This allows companies to accurately forecast if their investment in process mining will yield positive results and provide a return which outweighs the associated costs. Understanding ROI is essential to evaluating process optimization needs, implementing changes with confidence and reducing costs through innovative automation solutions.

As presented by the company on which we paid attention, this integration in the everyday development of software robots, ends up being considered as "Accelerating RPA with Endto-End Process Understanding and Monitoring" (UiPath, 2022). Understanding and monitoring processes from end-to end is essential for successful implementations of robotic process automation. Non-technical companies usually have difficulties in effectively integrating RPA into their existing systems due to the complexity of process mapping, but with end-to-end process understanding, getting started can be much easier. By having a holistic approach to process evaluation and modeling, process mining customers are able to identify critical processes at each step and accelerate implementation timelines. Additionally, companies can achieve greater ROI by automating more complex processes, who up to that point would not have been able to analyze it from a technical perspective, making a complex business analysis of the entire flow. Without such visibility of the entire system, it is impossible for individual components of a business process to operate correctly or efficiently. A robust end-to-end approach can provide granular insights into automated processes, helping to identify potential problems before they occur or optimize processes when the need arises. Real-time monitoring of RPA outcomes allows businesses to understand user behavior more thoroughly, identifying areas that need improvement or further optimization. With improved visibility into user data, they can refine existing system infrastructure while reaping the benefits that the automation offers.

4. Results and discussions

Ensuring successful implementation of processes within an organization requires process mining with robotic process automation to maximize efficiency and minimize costs. Process mining and RPA together offer unprecedented opportunities for businesses to gain insight, develop strategies and automate complex tasks.

Strategic goals are an integral part of leveraging process mining with robotic process automation. This combination of tools links the capabilities of process mining with pre-programmed bots to automate processes, resulting in improvements both in efficiency and accuracy. It can be considered as a strategic pair made by those two revolutionary technologies, can provide organizations with dynamic, data-driven insights into the effectiveness of their operations and contribute to clear goals for process improvement. RPA can examine existing processes and then identify bottlenecks, redundant activities, inconsistent approaches and mistakes due to human error. By pairing this analysis with software robots that can be programmed to replicate detailed execution logs, organizations can see significant improvements in cost savings, scalability as well as customer service from automating a bunch of tasks.

With predictive analytics based on past, present, and evolving trends within the operational structure, automated RPA supplemented by process mining can deliver accurate real-time metrics to identify inefficiencies and improve upon processes that are not meeting expectations. In this way, process mining with robotic process automation enables more informed decision-making as well as more tangible progress towards optimal levels of productivity.

An indicator we take into account when it comes to results is represented by the full time equivalent. FTE in RPA process mining is an interesting and complex area of study, as it seeks to understand the use of robotic process automation to supplement or replace traditional human labor for the purpose of providing analytics. Automation has become a major part of the modern workplace, allowing employers to reduce overhead costs while increasing the overall efficiency.

This indicator in a general context is a measure that captures the total labor effort for a project or organization regardless of the number of part-time employees needed to accomplish it. Expressed as a ratio, FTE usually represents the amount of time an employee works divided by the amount of time required to be considered full-time at that particular workplace. Additionally, there are two components, one each for full and part-time workers. A single full-time employee contributes 1 FTE, while multiple part-time employees can share a percentage among them so their combined work adds up to 1 FTE. This calculation system is useful because it allows service providers and organizations to track productivity precisely in both labor quantity and quality simultaneously. Using FTEs spares employers from needing to administer inconvenient manual tallies or calculations when establishing workload/employee averages.

However, because robotics technology is so sophisticated and specialized, there can be a lack of knowledge concerning how to evaluate its effectiveness in particular fields such as process mining, making FTE an attractive option that improves both accuracy and productivity. Using FTEs in this kind of process mining harnesses the human side of the equation, allowing experts to draw context and insights not available through the well known automated analysis. FTEs can capture intangibles such as industry standards and customer behavior by utilizing real-world experience and expertise.

As well as results of Garnter analysis are not just positive, but also promising, we admit that the perspectives of the implementation of such technologies are of real use, and the descriptions and data provided by the companies that provide them will not only fall into the category of sales and marketing strategy. Gartner calls a top strategic business trend as Hyperautomation. Also predicts that by 2024, organizations will, on average, reduce operational costs by 30% combining these hyperautomation technologies with redesigned operational processes using a "combination of multiple machine learning, packaged software, and automation tools to deliver work" (Gartner, 2020). They have also affirm that hyperautomation is considered to be the number one in their Gartner Top 10 Strategic Technology Trends.

Representing the most desired external vendor of such technologies, UiPath outlines the main benefits of the process mining services it provides. These are represented by native extract, transform and load (ETL) capabilities from the perspective of connecting to any database and transforming data without any third-party tools, the possibility of the easy to connect approach that unlocks process data from any line of business applications, out of the box principle that one application kickstarts the effective process mining with an average minimal effort, in the way of scalability, it is provided across large organizations and seen as an enterprise grade data management. In terms of security, stored data can be anonymized in environments called GDPR, tracy stands for the process graph to have an unique overview of the process that is designed for the users from business departments, there are possibilities to compare processes in order to understand their impact of optimizations through automation, and last but not least, business rules of applying KPIs and tags considering the target of staying on track with each key business goal (UiPath, 2022).

As their advanced studies show in terms of the Insurance perspective in a contact center automation project, overall an amount of 80% of work could be standardized and also around 568K in costs saving were confirmed being realized only in the contact center department.

5. Conclusions

Understanding the effective process is the key in the way of automating it. Investing in effective processes to achieve desired outcomes is critical, but navigating the gap between process expectations and process realities can be challenging. This gap can represent itself as a subtle discrepancy or large divergence, resulting in difficulties reaching goals or missing important requirements. Catching these discrepancies early on could help prevent costly situations further down the road. Process expectation vs process reality is an intriguing subject to explore further. While it may appear that processes are designed to meet certain goals, there may be deviations from this intentioned outcome in the real-world setting. Moreover, in development or implementation phases of procedures, underlying assumptions that are held by the designers may differ substantially from those who coordinate the actual task or activity. This discrepancy can lead to institutionalizing biases and misalignment with desired outcomes.

As such, it's important to closely monitor your processes both qualitatively and quantitatively in order to ensure expectations are met and appropriate feedback is obtained at the right times. Additionally, thorough risk analysis during the planning phase is strongly recommended as it can uncover potential issues that lead to unexpected realities. By building flexibility into plans and considering likely options for implementation, organizations will be better prepared when, inevitably, reality does not match expectation.

In order to fill this gap between process expectation vs. process reality, the actual key solution is using process mining as a business analyst support assistant that can provide insides and other perspectives of the actual business processes, of which they may not be aware from a first view as an advanced analysis. This fact comes to the aid of the automation development process, the subsequent changes and problems encountered after the moment of moving the software robot into the production environment, being significantly reduced.

Automation has been an immense challenge for businesses needing to perform routine tasks with minimal human intervention. Process mining provides an effective way of addressing these challenges by allowing processes to be identified, visualized, and optimized in order to streamline workflow and make the most efficient use of resources by the collaboration with other departments in the organization, and measure how successful each process is as a whole.

With this technology, organizations can simulate changes that may lead to higher productivity gains than traditional approaches or manual intervention. Additionally, process mining can help facilitate decision-making processes and optimize resource utilization within businesses. The ability to monitor processes from end-to-end and identify problems before they become costly can reduce inefficiencies and increase customer satisfaction. Additionally, process mining yields valuable analytics about business performance, allowing for informed decision making that ultimately leads to improved productivity. In this way, automation using process mining can have a major impact on modern businesses.

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