Automating Financial Reconciliation: Leveraging RPA for Efficiency and Accuracy in Banking Operations

Elheme Azemi[1,*,†], Saimir Bala[2,3,‡]

[1]Raiffeisen Bank Kosovo, Prishtinë, Kosovë
[2]Humboldt-Universität zu Berlin, Berlin, Germany
[3]SAP Signavio SE, Berlin, Germany

Abstract

Financial reconciliation is a critical process in banking operations, ensuring the accuracy and integrity of financial data. Traditional manual reconciliation methods, particularly for card and ATM transactions, are time-consuming and prone to human error, consuming approximately 426 minutes per day. This paper explores the inefficiencies of manual reconciliation processes and presents the implementation of Robotic Process Automation (RPA) as a solution to enhance efficiency and accuracy. By automating the interaction with various external systems, RPA reduces manual effort and improves data integrity. The practical outcomes of this implementation include significant time savings, with the overall transaction reconciliation process being automated and executed in just 70 minutes, resulting in 1.47 FTE (Full-Time Equivalent) savings. This paper provides a detailed analysis of the problem, the RPA solution, and the measurable benefits achieved, highlighting the transformative potential of RPA in banking operations.

Keywords

robotic process automation, bank industry, financial reconciliation

1. Introduction

Financial reconciliation plays a vital role in banking operations by verifying the accuracy and integrity of financial data. This process is essential for maintaining trust, compliance, and operational efficiency within financial institutions. However, this activity was traditionally performed manually, consuming, only for aligning card transactions, up to 60 minutes per day. As the process was performed manually, it introduced inefficiencies and was prone to human error, particularly because access to foreign systems was limited due to outsourcing arrangements that did not allow interfacing with external systems programmatically.

These inefficiencies in the manual reconciliation process posed significant challenges to banking operations. The lack of automation not only consumed valuable time but also increased the risk of errors, which could have substantial financial and operational implications. In addition, employees were facing considerable burden due to the massive workload that required them to manually analyze more than 160 files daily to extract precise information. Mistakes would lead to the repetition of the whole reconciliation process. Such manual approach was not sustainable in the face of increasing data volumes and the need for real-time accuracy.

To overcome these difficulties, the implementation of Robotic Process Automation (RPA) emerged as a suitable solution [1]. RPA could effectively replace human interaction with various external systems, thereby reducing manual effort and enhancing accuracy. The goal was to automate the reconciliation process, leveraging RPA to streamline operations and improve data integrity. In practice, the adoption of RPA led to significant improvements. This paper presents three cases in which the financial reconciliation process was automated with RPA, resulting in measurable outcomes. For instance, in one case we report 0.25 FTE (Full-Time Equivalent) savings and a reduced execution time from 60 to just 2 minutes.

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*Corresponding author.
†These authors contributed equally.
elheme.azemi@raiffeisen-kosovo.com (E. Azemi); saimir.bala@sap.com (S. Bala)
0000-0001-7179-1901 (S. Bala)

These practical and measurable outcomes underscore the effectiveness of RPA in transforming financial reconciliation processes.

The remainder of this paper is structured as follows. Section 2 provides the organizational context and problem statement, detailing the specific challenges faced in the manual reconciliation process. Section 3 presents the case description, outlining the current manual process and its limitations. Section 4 discusses the automation of the financial reconciliation process, explaining how RPA was implemented to address these challenges. Section 5 presents the results and impact of the automation, highlighting the practical outcomes and benefits achieved. Section 6 offers a discussion on the scope and limitations of the RPA implementation and its implications for research and practice. Finally, Section 7 concludes the paper, summarizing the key findings and implications for banking operations.

2. Organizational Context and Problem Statement

In this section we describe the organization's context and detail the problem they were facing.

2.1. Organizational Context and the Financial Reconciliation Process

The organization, subject of this study, is a prominent financial institution with a rich history and a strong presence in the banking sector. It operates across multiple regions and offers a wide range of financial services, including retail banking, corporate banking, and investment services. The institution is known for its commitment to innovation and customer satisfaction, continually striving to improve its operational efficiency and service quality.

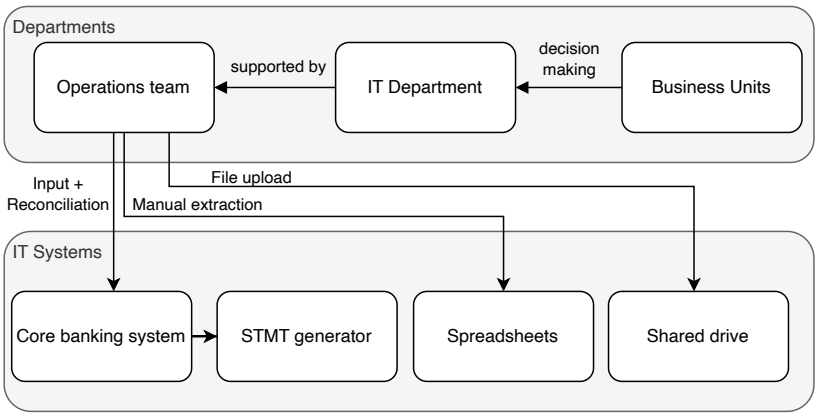

Figure 1: Organizational context and data flow in financial reconciliation

Figure 1 illustrates the setting of our work, depicting the main departments and information systems involved in the financial reconciliation process. The organization's operations are supported by a robust IT infrastructure and a dedicated team of professionals who ensure the smooth functioning of various processes. Key actors involved in these operations include the Operations team, IT department, and various business units. The Operations team is responsible for executing three critical reconciliation processes: daily transaction reconciliation, Mastercard reconciliation, and ATM report generation. The IT department provides technical support and maintains the systems used in these processes, while the business units rely on the accuracy and timeliness of these reports for decision-making.

The core systems involved in these processes include the T24 core banking system, used for account management and transaction processing. Additionally, the organization uses Microsoft Excel spreadsheets for data manipulation and reporting, and various shared drives for file storage and access. Other systems include the statement (STMT) Generator for statement generation and the company's share drive for storing and accessing PDF and Word files. These systems are integral to the organization's operations but also contribute to the complexity of the manual processes.

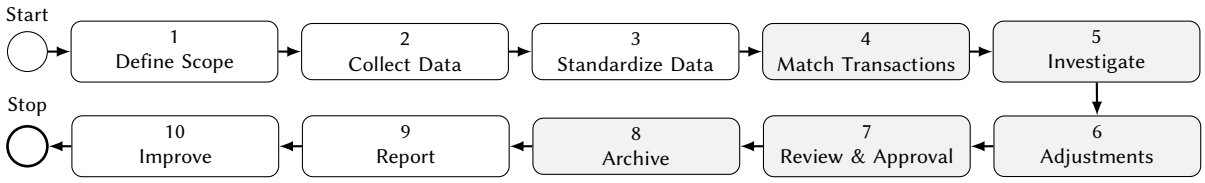

Figure 2: Steps of the financial reconciliation process. Critical manual steps are highlighted in gray.

The financial reconciliation process, illustrated in Figure 2, consists of the following steps that ensure transactional consistency across systems. (1) *Define Scope*: The process begins by determining the scope of reconciliation, including account types, periods, and entities involved; (2) *Collect Data*: Relevant data is gathered from primary sources such as bank statements and sub-systems; (3) *Standardize Data*: Collected datasets are normalized to a common format to enable meaningful comparisons and automation; (4) *Match Transactions*: Records from different systems are matched automatically or manually based on defined rules; (5) *Investigate*: Any unmatched or suspicious entries are examined to identify root causes, such as timing issues, errors, or omissions; (6) *Adjustments*: Based on the investigation, correcting journal entries or reconciliations are posted to the ledger; (7) *Review & Approval*: The reconciled data is reviewed by supervisors or control functions and formally approved; (8) *Archive*: Supporting documents, reconciliation files, and approvals are securely stored for future audits; (9) *Report*: Summary reports are prepared for auditors, management, or compliance units to reflect reconciliation outcomes; (10) *Improve*: Lessons learned are analyzed to improve processes and prevent recurring mismatches or inefficiencies.

The process concludes with documentation and insights that contribute to continuous improvement in financial control practices.

2.2. Problem Statement

The financial reconciliation process is one critical area in which the organization faced challenges. Especially, the steps 4 (Match Transactions) – 8 (Archive) in Figure 2 required intensive manual work. In the situation faced, the company identified three main processes as *critical*, *cumbersome* and *inefficient*: daily transaction reconciliation, Mastercard reconciliation, and ATM report generation. These processes involved multiple steps, such as opening and manipulating Excel files, extracting data from various systems, and generating reports, all of which ware performed manually by the operations team.

The manual nature of these processes not only consumes a significant amount of time and resources but also increases the risk of human error. This could lead to *inaccuracies* in financial reporting, *delays* in decision-making, and potential *compliance* issues. Moreover, the manual handling of large volumes of data was overwhelming for the operations team, affecting their productivity and job satisfaction. It was clear that the manual processes were not sustainable and pose significant risks to the organization's operational efficiency and customer satisfaction.

3. Case Description

This section describes three cases of the reconciliation process, namely daily transaction reconciliation, Mastercard reconciliation, and ATM report generation. These cases involved comparing and verifying data from multiple external and internal sources to ensure that all financial records are complete, accurate, and aligned.

In the following, we describe the cases according to the following template i) manual process overview; ii) automation objectives; and iii) technical environment. Manual process overview describes the which steps of the reconciliation process in Figure 2 were undertaken manually. Automation objectives outlines the needs and the goals of automating these steps. Technical environment describes the technical

environment in which the process is executed.

3.1. Case 1: Daily Transaction Reconciliation

Manual Process Overview. The existing manual process for daily transaction reconciliation involved several steps. The operations team opens an Excel main sheet stored in a shared location, finds the card number, and uses it to locate the corresponding account number in the T24 core banking system. For each account, a statement (STMT) is generated, and payments are identified based on specific codes. This process is labor-intensive and prone to human error. The process involves interacting with several systems, including T24, the STMT Generator (APS), MS Excel, and shared drive folders. The operations team needed to reengineer their workflow to support the automated process. Figure 6 illustrates the manual process.

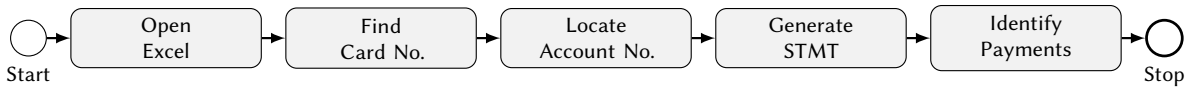

Figure 3: Manual process overview for daily transaction reconciliation

Automation Objectives. The primary goal of automating this process was to streamline the identification of account numbers based on card numbers, generate statements, and file payments accurately. This would significantly reduce manual effort and improve the accuracy of the reconciliation process. However, some payments may not be identified correctly, especially those with comments such as `"Reversed"`, `"Closed"` or `"DC"` which would need to be handled manually.

Technical Environment. The automation will interact with several systems, including T24 (the core banking system), the STMT Generator (APS), MS Excel, and shared drive folders. The automated process will run daily to process data from the previous day's file. It involves opening the Excel file, retrieving card numbers, finding account numbers in T24, generating statements, and saving the data back into the Excel file. Key personnel involved in the delivery plan include the Process Expert, Process Owner, ICT Coordinator, RPA Analyst, and RPA Developer.

3.2. Case 2: Mastercard Reconciliation

Manual Process Overview. The current manual process for Mastercard reconciliation involves the operations team opening an Excel main sheet stored in a shared location, copying relevant data from a PDF file and 6 HTML files into the Excel sheet, and saving the file. This process is time-consuming and prone to errors. The operations team will need to reengineer their workflow to support only exception cases that cannot be processed by the automated system. Figure 4 presents the manual process flow for Mastercard reconciliation prior to automation.

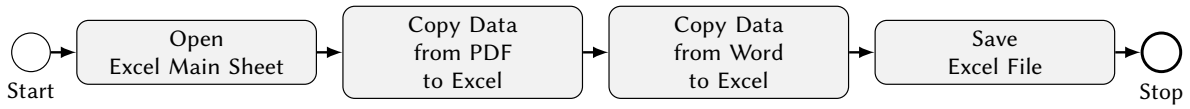

Figure 4: Manual process overview for Mastercard reconciliation

Automation Objectives. The primary goal of automating this process is to ensure that the Excel main sheet is completed accurately and correctly. This will significantly reduce manual effort and improve the accuracy of the reconciliation process. There are no specific limitations mentioned for this process automation.

Technical Environment. The automation will interact with MS Excel and the company's shared drive. The automated process will run daily to process data from the previous date, collecting data into a main Excel sheet stored in a shared location. Data will be collected from one PDF file and six html files dedicated to each day. Key personnel involved in the delivery plan include the Process Expert, Process Owner, ICT Coordinator, RPA Analyst, and RPA Developer.

3.3. Case 3: Reconciliation of ATMs Combining RPA and AI

Manual Process Overview. The current manual process for ATM reconciliation, cash monitoring and replenishment reporting involves employees in the Card Department manually reviewing over 160 journal files located in a shared folder. They extract data on remaining balances and recent deposits in ATMs to create a report shared with Front Office teams, who then prepare cash refills accordingly. Additionally, during the reconciliation process, staff must review all journal files to identify transaction fees. Match and reconcile fees for each transaction, ensuring accuracy. This process is labor-intensive and time-consuming. Figure 5 illustrates the manual workflow for ATM cash monitoring and replenishment reporting.

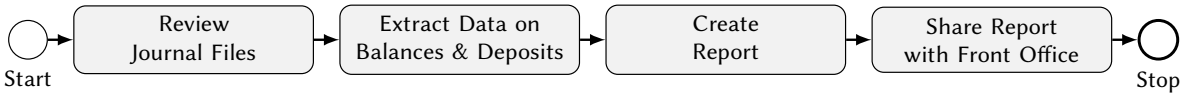

Figure 5: Manual process overview for ATM cash monitoring and replenishment reporting

Automation Objectives. The primary goal of automating this process is to enhance efficiency, accuracy, and operational insight. By leveraging AI technology for data modeling, the system will automate data extraction, report generation, and distribution, and provide predictive analytics for ATM usage and replenishment urgency based on location data. There are no specific limitations mentioned for this process automation.

Technical Environment. The automation will interact with the shared folder, Excel, and the email system. The automated process for journal file processing will involve the robot accessing the shared folder, extracting data, classifying and structuring data, generating reports, and dispatching emails. Key personnel involved in the delivery plan include the Process Expert, Process Owner, ICT Coordinator, RPA Analyst, and RPA Developer.

4. RPA Implementation

Following a comprehensive process analysis, the financial reconciliation tasks were identified as strong candidates for automation based on three primary criteria: *high task frequency* (daily or near-daily execution), *rule-based and repetitive* activities, and *structured and semi-structured input* data formats. This section details the implementation of RPA across three key use cases: daily transaction reconciliation, Mastercard reconciliation, and ATM reconciliation, cash monitoring and reporting.

4.1. Process Redesign for Automation

In line with Dumas et al. [2], the process was adapted before implementation. Each manual process was reengineered to support automation by standardizing the decision logic and decoupling human-dependent steps. The redesigned processes follow a similar structure comprising six high-level stages. First, all required files (e.g., Excel, Word, PDF, HTML) are retrieved from shared folders or predefined storage paths. Second, structured data (e.g., Excel and HTML tables) is accessed directly through native selectors, while semi-structured formats (e.g., PDF and Word files) are processed using Optical Character

Recognition (OCR) and pattern matching. Third, extracted content is cleaned, transformed, and mapped to an internal unified data schema to ensure consistency across different sources. Fourth, defined business rules are applied to match transactions, identify exceptions, and compute aggregates. Fifth, results are compiled into standardized Excel reports, highlighting matched, unmatched, and suspicious entries. Finally, errors such as file access failures, unrecognized formats, or reconciliation mismatches are logged, and appropriate notifications are sent to designated stakeholders.

4.2. Development Environment and Platform

The RPA bots were developed using the commercially available RPA platform Blue Prism[1], providing capabilities for workflow design, UI automation, and integration with legacy systems. Key technical components included the T24 Core Banking System, accessed through user interface automation to retrieve account statements based on card numbers. The Accounts Processing System (APS) STMT Generator was used to generate detailed statements for reconciliation. Microsoft Excel and Word served as primary formats for data input and output, automated via COM interfaces and templates. PDF reports were parsed using OCR libraries with regular expressions for key data identification. Shared drives acted as the source location for all input files and the destination for output reports. The email system was used for automated report dispatch and notification in case of exceptions.

4.3. Implementation Details by Reconciliation Case

Case 1: Daily Transaction Reconciliation. The bot automatically opens the shared Excel main sheet, reads card numbers, locates the associated account numbers in the T24 system, and generates statements using the APS tool. Identified payments are logged, and unmatched items are flagged for manual review. The process completes within minutes and eliminates repetitive navigation between systems.

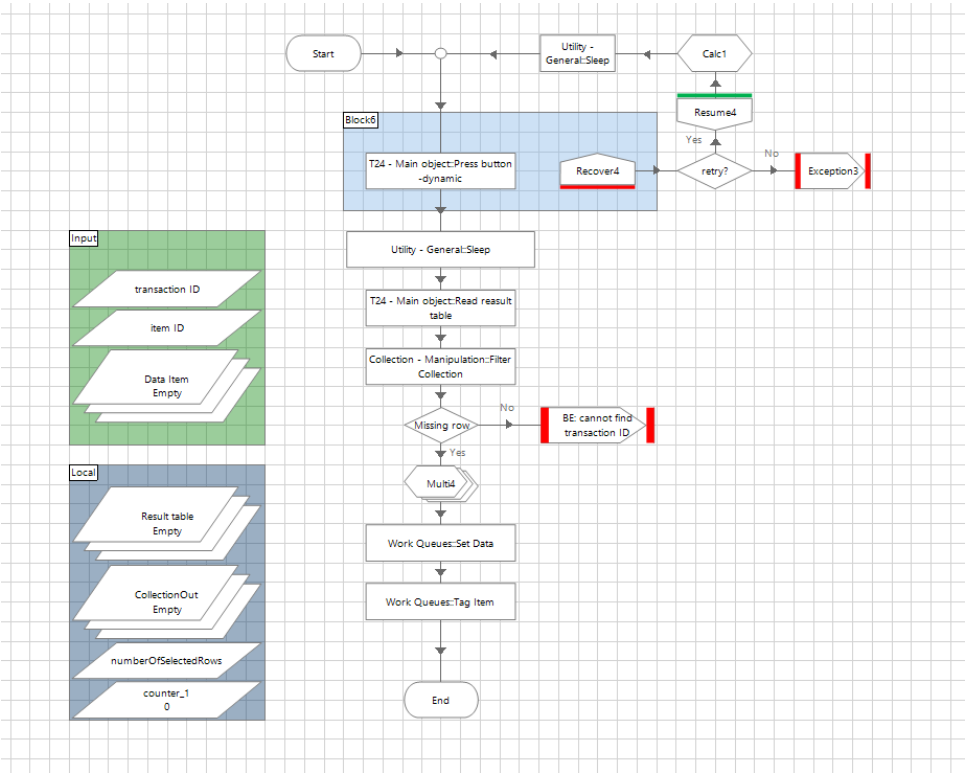

Figure 6: Daily Transaction Implementation in Blue Prism

[1] https://www.blueprism.com

Figure 6 shows a screenshot of the RPA solution developed in Blue Prism for automating the daily transaction reconciliation process. The interface captures flow of the bot's execution where transaction data is extracted from (input) the core banking system (T24) and reconciled against internal transaction logs stored on a shared drive (local). In case of missing transactions or mismatched, exceptions are thrown that will be handled manually by the employees.

Case 2: Mastercard Reconciliation. The automation collects input from one PDF file and six Word documents per day, extracting relevant transaction information and populating a shared Excel sheet. The bot ensures structural consistency in data entry, improving reliability. The process executes daily without human intervention, except for flagged anomalies.

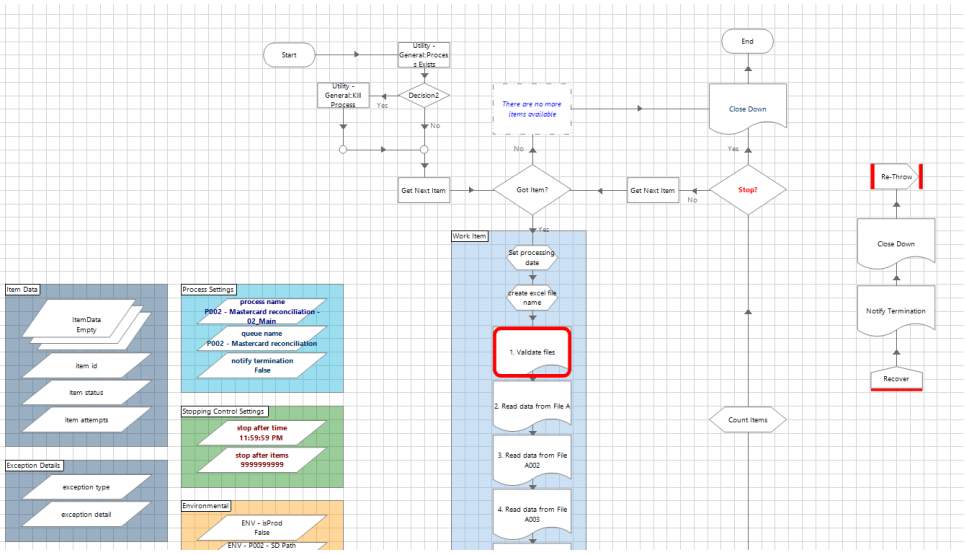

Figure 7: Master card reconciliation implemented in Blue Prism

Figure 7 shows a screenshot of the RPA solution for automating the Mastercard reconciliation process. The process' flow continues as long as there are items to process from the card transactions. At the same time. creates and populates the spreadsheet files.

Case 3: ATM Reconciliation and Report Generation. The automation retrieves over 160 ATM journal files, extracts and classifies balance and deposit data, and generates a consolidated report. Additionally, AI-based logic models historical data to provide predictions on cash replenishment urgency based on location and usage trends. The report is distributed automatically via email to the Front Office team. The reconciliation part of ATM includes steps by identifying the fee for each transaction performed with ATM, data is taken from particular journal files and consolidated as per daily transactions.

Figure 8 shows a screenshot of the RPA solution for monitoring the ATM transactions. The process flow can be seen on the left. In the center, an interface is presented to the user who can instruct the robot to match data entries related to ATM. The robot automatically generates reports including data, location and several analysis.

Governance and Delivery. Each implementation followed an agile delivery model with close collaboration between functional and technical stakeholders. Key roles involved included the Process Expert, Process Owner, ICT Coordinator, RPA Analyst, and RPA Developer. Regular review sessions ensured alignment with business objectives, while user acceptance testing validated the functionality and robustness of the bots.

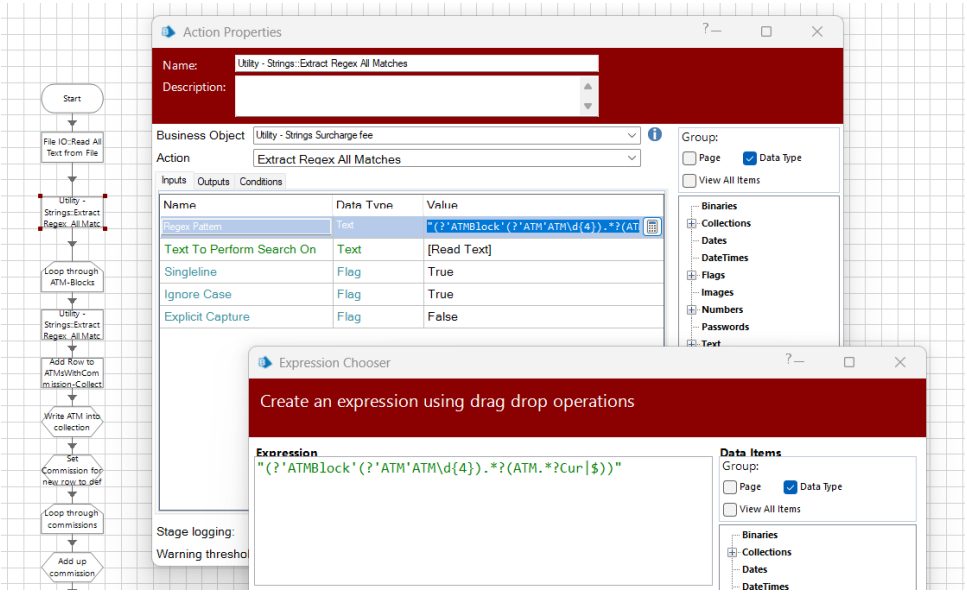

Figure 8: ATM Reconciliation and Report Generation in Blue Prism

5. Results and Impact

Deploying the RPA solution resulted in immediate and measurable improvements in operational efficiency and process reliability. Here, we outline the improvement observed after implementation.

5.1. Time Savings and Efficiency

Prior to automation, the MasterCard reconciliation process required approximately 60 minutes of manual effort each business day. Additionally, on Mondays, staff had to reconcile transactions from the weekend, which could extend the process up to 3 hours—especially if any discrepancies were found, as the process would have to be restarted from the beginning.

With the robot in operation, the task is now completed in under 2 minutes—representing a 98% reduction in execution time. This time savings translates to an estimated 0.25 Full-Time Equivalent (FTE) in annual labor capacity, freeing finance personnel to focus on higher-value tasks such as exception handling and financial analysis.

Table 1 summarizes the quantitative impact of RPA across three key financial reconciliation processes: Mastercard reconciliation, daily transaction reconciliation, and ATM reconciliation and reporting. The results indicate substantial improvements in execution time, annual time savings, and estimated labor capacity. For example, the Mastercard reconciliation process saw a reduction in daily execution time from 60 minutes to just 2 minutes, while daily transaction reconciliation, previously requiring nearly 5 hours, now completes in approximately 1 hour. Collectively, these automations yield an estimated annual time savings of over 2100 hours and free up approximately 1.47 Full-Time Equivalents (FTEs), underscoring the efficiency gains and operational scalability enabled by RPA implementation.

5.2. Process Quality and Organizational Impact

The automation of reconciliation processes not only improved speed but also significantly enhanced process accuracy and stability. Manual data entry and cross-referencing previously introduced frequent, albeit minor, errors. In contrast, the robot's deterministic logic has resulted in near-zero error rates on standard inputs. Exceptional cases are automatically flagged and routed to human operators, improving traceability and reinforcing trust in financial controls.

Operational stability has also improved markedly, with the robot achieving a *100% success rate* during routine business days since go-live. Staff members reported increased confidence in the accuracy and

Table 1
Impact of RPA on Reconciliation Processes. Metrics: DET – Daily Execution Time, ATS – Annual Time Savings, EFTES – Estimated FTE Savings

Process	Metric	Before Automation	After Automation	Improvement
Cards	DET	60 minutes	2 minutes	58 minutes
	ATS	∼365 hours/year	∼12 hours/year	∼353 hours/year
	EFTES	–	∼0.25 FTE	–
Daily Transaction	DET	298.95 minutes	60 minutes	238.95 minutes
	ATS	∼1825 hours/year	∼365 hours/year	∼1460 hours/year
	EFTES	–	∼1.02 FTE	–
ATM and Report	DET	67.5 minutes	8 minutes	59.5 minutes
	ATS	∼410 hours/year	∼49 hours/year	∼361 hours/year
	EFTES	–	∼0.20 FTE	–
All	**DET**	∼426.45 minutes	<70 minutes	∼356+ minutes
	ATS	∼2500 hours/year	∼425 hours/year	∼2100 hours/year
	EFTES	–	**1.47 FTE**	–

consistency of results and appreciated the structured format of the system-generated reports. Moreover, automation helped *standardize workflows* that previously varied by individual work styles.

Feedback from process owners further emphasizes the positive reception: the manual process was considered complex and time-consuming due to the volume of files and manual comparisons. Since manual processes are repetitive and monotonous, they fail to support employee satisfaction and motivation. With automation, users noted both increased efficiency and enhanced motivation. They expressed enthusiasm for expanding automation to additional processes, highlighting a shift in mindset toward innovation and continuous improvement. Strategically, this initiative has served as a pilot for broader smart automation, reinforcing the value of applying BPM and RPA principles to rule-based tasks and inspiring further process innovation within the finance department.

6. Discussion: Significance, Relevance, Scope and Limitations

The implementation of RPA in financial reconciliation processes has demonstrated significant improvements in operational efficiency and accuracy. This study provides empirical evidence of the transformative potential of RPA in banking operations. The findings of this study align with existing literature on RPA, in particular with the work of Syed et al. [1], which emphasizes the strength of RPA in high-volume, rule-based tasks that operate on structured data. Our case corroborates the observations by Plattfaut et al. [3], who note that the greatest benefits of RPA arise in tasks with high frequency and low variability, typical of many middle-office banking operations. Moreover, our work adds empirical evidence to Ivančić et al.'s [4] observation that successful RPA adoption depends not only on technical feasibility but also on organizational readiness and integration with evolving systems. This underscores the importance of a holistic approach to RPA implementation, considering both technical and organizational factors.

In practice, the automation of Mastercard reconciliation, daily transaction matching, and ATM report generation yielded time savings of over 90%, translating to an estimated 1.47 Full-Time Equivalents (FTE) per year. This substantial reduction in manual effort allows staff to focus on higher-value tasks and strategic initiatives. Efficiency has increased and mistakes were reduces to near-zero error rates, enhancing data integrity and reducing the risk of financial and operational implications associated with manual errors. This improvement in accuracy is crucial for maintaining trust, compliance, and operational efficiency within financial institutions.

While RPA delivers clear efficiency gains, our findings also expose important limitations consistent with broader academic concerns. Although automation drastically reduces routine effort, it does not

eliminate the need for human oversight—especially for exception handling, which remains a bottleneck in processes involving judgment or unstructured inputs. This supports the call for hybrid approaches that combine RPA with human intelligence or machine learning to handle variability and change [5, 6]. Future research should explore the integration of RPA with other technologies, such as machine learning and artificial intelligence, to address these limitations. Additionally, further studies are needed to understand the long-term impact of RPA on culture, roles, and the broader financial ecosystem.

In conclusion, while a large part of the existing body of knowledge [7, 3] focuses on studying factors for RPA success, our paper demonstrates the benefits of RPA in practice. The findings underscore the strategic and organizational value of smart automation (RPA and AI), making it a compelling solution for financial institutions aiming to optimize their operational processes.

7. Conclusion

The implementation of RPA in the financial reconciliation processes at the studied financial institution has demonstrated significant improvements in operational efficiency and accuracy. By automating the daily transaction reconciliation, Mastercard reconciliation, and ATM report generation processes, the organization achieved substantial time savings, reducing the overall transaction reconciliation process from 426 minutes to just 70 minutes per day. This translates to an estimated 1.47 Full-Time Equivalent (FTE) savings, allowing staff to focus on higher-value tasks and strategic initiatives.

Moreover, the automation has led to near-zero error rates, enhancing data integrity and reducing the risk of financial and operational implications associated with manual errors. The successful deployment of RPA has not only improved the efficiency and accuracy of financial reconciliation but also served as a pilot for broader automation opportunities within the finance department. This initiative underscores the transformative potential of RPA in banking operations, paving the way for further digital transformation and process-minded thinking. The findings highlight the strategic and organizational value of RPA, making it a compelling solution for financial institutions aiming to optimize their operational processes

Declaration on Generative AI. During the preparation of this work, the authors used ChatGPT-4o for grammar and spelling checks. They checked, edited and take full responsibility for the content.

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