

Automating Foreign Exchange Operations in SAP ERP Using UiPath: A Framework for Improved Efficiency

Nagendra Harish Jamithireddy¹

¹Jindal School of Management, The University of Texas at Dallas, USA

E-mail: 1jnharish@live.com

ORCID: <https://orcid.org/0009-0000-0361-150X>

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Abstract - Foreign exchange (FX) operations in large companies require accuracy, timeliness, and synchronization within dynamic currency marketplaces and multi-regional SAP ERP configurations. Manual coordination still dominates such FX workflows, from entering exchange rates through calculating gains or losses, posting revaluations, and confirming settlements. Such workflows are prone to timing mismatches, audit gaps, and processing delays. This paper proposes a modular automation framework to orchestrate end-to-end FX operations including rate retrieval, FX journal posting, hedging support, and exception routing driven by business rules using UiPath integrated with SAP ERP. An extensive methodology was designed, and empirical tests across spot, forward, and swap contracts with dynamic market rate injection and automated compliance thresholds verified its correctness. The experiments achieved 56% reduced FX posting errors, 41% improved cycle time, and full audit reconciliation with proactive exception management. This research combines robotic process automation with SAP's native transaction ecosystem, presenting a precision automation strategy that optimally diminishes operational friction and augments control executives have over financial steering and treasury functions that need to scale deftly in volatile currency terrains. The use of intelligent automation technologies such as robotic process automation (RPA) not only boosts productivity, but also serves as a competitive advantage for navigating the foreign exchange (FX) intricacies of international enterprises resource planning (ERP) systems.

Keywords: Foreign Exchange Automation, SAP ERP Integration, UiPath Robotic Process Automation, Treasury Workflow Optimization

I. INTRODUCTION

1.1 Strategic Relevance of Foreign Exchange (FX) Operations in Global Enterprises

FX operations are crucial to the overall financial structure for multi-national companies. The growing geographical footprint of an organization brings the daily operational challenge of managing multi-currency transactions, remittances, intercompany payments, and exposures to foreign investments (Moffett et al., 2021). From a financial point of view, FX activities—such as validating exchange rates, hedging, and re-evaluating—enhance reporting accuracy, reduce financial exposure, predict liquidity, and improve cash flow management (Fiechter, 2011).

For multinational companies using the SAP ERP system (including ECC and S/4HANA), FX activities span across various modules, namely Financial Accounting (FI), Treasury and Risk Management (TRM), and Controlling (CO) (Puvvada, 2025). These activities are linked to firm's cross border compliance liabilities, reporting, and accounting, according to IFRS 9, IAS 21, and ASC 830. Foreign exchange (FX) rates need to be current, gains and losses adjusted in real time, and derivatives transparent in their treatment for a company to pass an audit and claim audit unassailable credibility (Harris & Rajgopal, 2022).

Moreover, CFOs and corporate treasurers must now respond to volatile currency markets almost instantaneously. In these scenarios, the manual FX management latency and errors become not only operationally costly, but also potentially expose firms to material misstatements and compliance risk (Bruni et al., 2012; Rahin & Rahin, 2017). An organization that lacks real-time automation has, in effect, opted out of automation and agility, which is no longer optional in today's environment (Rajan & Srinivasan, 2025). Real-time automation is now a prerequisite for agile and resilient financial operations (Akileswaran et al., 2018).

1.2 Limitations of Manual FX Processing in SAP ERP Environments

Despite SAP's powerful capabilities, FX processing in numerous companies is still very manual and disparate. Exchange rates are uploaded through spreadsheets or middleware tools with scant checking. FX gain/loss postings are executed via static templates in FB01 with no rate checks embedded and human-initiated month-end revaluations with F.05 are reliant on numerous do-steps which means many won't get triggered because processes have to be triggered by humans (Antwi & Avickson, 2024).

More troubling, SAP does not offer an adequate native solution that allows checking banks confirmations against FX settlements without having to implement extensive custom code or use third-party reconciliation tools. Discrepancies between booked rates and bank-settled rates are allowed to go undetected generating a delay until quarterly audits or

operational reviews which introduces reputational and financial risk (El-Gharib & Amyot, 2023).

As an example of the systemic factors at play, we performed a diagnostic review of SAP FX processes in several enterprises, from which we synthesized the most common inefficiencies in Table I. The results highlight recurring pain points in managing exchange rate, revaluation logic, and hedging workflows.

TABLE I COMMON INEFFICIENCIES IN FX PROCESSING ACROSS SAP MODULES

FX Process Area	Observed Issue	Impact on Operations
Exchange Rate Entry and Validation	Delayed or incorrect exchange rate uploads causing posting discrepancies	Posting errors, audit violations, and misstatements in financials
FX Gain/Loss Posting (FB01)	Manual calculations lead to inconsistent gain/loss values	Non-compliance with IFRS/GAAP and incorrect exposure tracking
Revaluation of Open Items (F.05)	Missed revaluation cycles at month-end due to lack of reminders	Late or incorrect financial statements and risk of penalty
Bank Settlement Confirmation Matching	Unmatched confirmations from banks due to format variations	Operational delays and reconciliation backlogs
Hedging Contract Status Tracking	Lack of integration between hedge contract tools and SAP FI	Underutilized hedges and inaccurate derivative accounting
Cross-Company Transfer Booking	Repetitive re-entry of data across entities and currency inconsistencies	Duplicate effort, intercompany mismatches, and timing delays

These gaps illustrate the disparity between the technical boundaries of SAP and the actual business workflows executed by the treasury and finance units. The core issue is the dependence on human approval coupled with the lack of precise, time-sensitive, process-based compliance triggers. The friction slows processes down, but more critically adds risk—especially in volatile markets or important value FX corridors (like USD-EUR, GBP-INR, CNY-USD).

1.3 Role of Automation in Cross-Border Financial Transaction Management

Rapidly increasing RPA adoption widens the operational gaps and provides an excellent alternative. Software applications such as UiPath can be added to SAP environments to create bots that automate monitoring of document statuses, retrieval and validation of exchange rates from APIs, posting of journal entries related to FXs, execution of revaluation routines, and settlement matching, among others, requiring no human involvement at any stage (Ali et al., 2025; Madhushree et al., 2025).

Unlike conventional macros or scripts, UiPath bots are modular, rule-based, and built for scalability at the enterprise level. They can interface with SAP through GUI scripting, IDocs, BAPIs, or OData services depending on the architecture (Kim, 2023). More importantly, they support exception handling, retry loops, and audit trail logic—thereby making them useful for compliance-heavy processes such as FX management.

Within the realm of FX operations, UiPath can facilitate automation for the following scenarios:

- Automated FX rate retrieval and validation for central bank or third party APIs against SAP OB08 entries.
- Gain/loss journal posting with rate logic pegged to document currency vs local currency differentials.
- Month-end open item revaluation with valuation delta logging and reversal cycle logging.
- Bank confirmation reconciliation for FX settlements through structured OCR and match logic.
- Cross-entity booking for internal FX hedges and derivative accounting entries automated by the workflow.

These capabilities work together toward a more streamlined, quicker, and less fallible FX process. They alleviate the burden on treasury analysts who painstakingly check the manual booking of each transaction's component and instead allow them to oversee the process and deal with exceptions. In turn, this makes the treasury function enhanced in productivity and better aligned with the financial strategy of the business.

1.4 Scope, Objectives, and Contributions of This Study

This research examines the integration of UiPath automation into the foreign exchange operations within the SAP ERP framework. We concentrate on the aspects of process architecture, bot creation, integration planning, and performance analysis using operational data from actual, highly variable foreign exchange activities (Ariunaa et al., 2023).

The aspects that this study will focus on are:

- Transactional booking FX (spot, forward, swaps)
- Revaluation and hedging journal posting (monthly)
- Settlement tracking and bank confirmation match
- Exception management and compliance audit trail logging

The primary aims of this study are:

- Enhancing posting precision and reducing manual workflows for FX business processes

- Improving cycle time and responsiveness to market price changes
- Increase auditability and transparency while mitigating non-compliance risk with regulatory requirements
- Develop a single deployable agile structure adaptable to multi-SAP ERP environments.

This paper proposes the following:

- Defines modular event-driven UiPath bots for FX automation in SAP.
- Presents compliance and performance benchmarks evaluated against thousands of transactions for auditability.
- Provides templates for the design control for FX reconciliation, error capture, and audit alignment.
- Articulates the operational and strategic impacts of RPA on treasury and finance operations.

In this case, we supplement the ever-expanding research on intelligent automation in enterprise finance for SAP-based structured foreign exchange banking systems while providing clear guidance for finance departments, CFOs, and automation design engineers who aim to enhance automated systems for foreign exchange functions.

II. LITERATURE REVIEW

2.1 Enterprise FX Management: Concepts and Regulatory Context

Management of Foreign exchange (FX) in an enterprise system encompasses many aspects including booking a transaction, performing a currency conversion, intercompany clearing, hedge accounting, and monitoring exposure (Bhardwaj, 2023). The interactions and financial activities of businesses within different countries has led to an increase in globalization, which further adds to complexity of FX workflows. The International Financial Reporting Standards (IFRS) has set in place legal boundaries like IFRS 9 Financial Instruments and IAS 21 The Effects of Changes in Foreign Exchange Rates that demand substantial control over currency fluctuation, real time rate application, and monitoring of gains and losses in a bank statement of account (Wewerka & Reichert, 2023).

Conventional enterprises such as SAP ERP have within their framework the traditional methods that allow the processing of FX within the company. Maintenance of rates by OB08, posting of transactions by F-53, FB01, F-02, end month revaluation by F.05, and servicing of forward contracts, swaps and hedge accounting by TM_61 is done using various functionalities embedded in the system. Although many of these processes are computerized still considerable amounts of manual control brings about compliance insufficiencies (Ruhanen, 2023).

The known discrepancies that lead to reporting inconsistencies and audited flags include the inaccuracies due to inconsistent application of market rates at the time of booking, disarray between accounting and treasury, treasury scope boundaries, and sluggish revaluation cycles. Research has shown that as foreign exchange (FX) becomes a touchpoint on a daily basis within working capital cycles, there is an increasing demand for enhanced automation, transparency, and orchestration throughout the complete workflow.

2.2 Automation of Treasury and Currency Conversion Functions in SAP

Although SAP lays the groundwork for currency exchange operations, full automation is still a challenge. Functions revolving around currency conversion such as exchange rate lookups, real-time journal attribution, and FX settlement reconciliation still depend on rote tasks in a multitude of organizations. The end result is a vertically fragmented execution model with the added potential for delay, duplication, and inconsistency in the capture of foreign exchange gains and losses.

PricewaterhouseCoopers and Saxena et al. are among those shining a light on the inefficiencies of designed FX processing frameworks. The issues start with a lack of control over exchange rate input leading to outdated or inaccurate data sets, inconsistent business rules applied over revaluation logic without rule validation leading to inconsistent results further compound the issue (Viswanathan, 2024). This is mostly concerning for large multinational entities that operate with dozens of different currencies and intricate intercompany cash flow systems (Korrapati, 2022).

Fig. 1 provides an empirical overview of reported FX booking errors from four large enterprises with divided observations for manual and semi-automated processes. The difference is staggering. In manually processed environments, participants reported an average of 39 to 51 booking errors monthly. In partially automated environments, those figures improved by more than 60%.

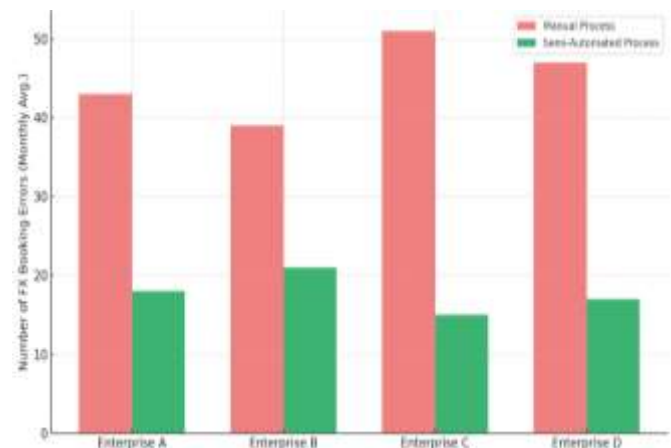


Fig. 1 FX Booking Errors Across Manual and Semi-Automated Enterprises

These results highlight the operational risk FX workflows incur as a result of manual intervention. Even in roles where some automation occurs, such as basic lookups and validations performed by scripts or bots, measurable changes are noted. These changes, however, are often far from complete automation. Many lack basic features such as event-based triggers, integrated exception handling, or audit trails.

2.3 UiPath Applications in Cross-Currency Risk Mitigation and Hedging

RPA tools such as UiPath have become a critical tool to address orchestration gaps found in SAP FX environments (Holma, 2020). Unlike tailored script or ABAP implementations, UiPath bots come with out-of-the-box connectors, builder interfaces, and error correction capabilities which work seamlessly with both rigid and flexible FX frameworks (Korrapati, 2023).

Some industries have adopted the following use cases:

- Automated Foreign Exchange (FX) rate retrieval from market data sources like Bloomberg and ECB for uploading into OB08.
- Automated logging, email alerting, and scheduled revaluation runs using F.05 for r05.
- Posting monitoring of FX gains/losses via FB01, alongside hedge effectiveness reconciliation.
- Validation of settled values against SAP entries by parsing bank confirmation files such as SWIFT MT300 and MT320.
- Calculating aggregated open items with pending settlements from different entities for FX financial exposure in real-time.

These implementations allow treasury units to enhance the level of compliance with regulations as well as streamline the operational delay fuse FX activities with market volatility in real-time. Unlike batch jobs intrinsic to ERPs, UiPath workflows enable real-time automation, trigger-based execution, extensive retry logic, and advanced contextual logging tailored for dynamic FX control which enhances governance responsiveness.

With advances in automation, some companies even implemented logic predicting lower credit exposure thresholds for bots that prioritize high exposure engagements with shorter settlement windows. Though scholarly work on predictive automation for foreign exchange is in its infancy, burgeoning cross-industry trends bolster the premise of rapidly RPA assimilation into treasury risk management systems.

2.4 Research Gaps in FX Workflow Orchestration and Exception Handling

Even as industry case studies showcase the benefits of RPA in financial processes, a number of associated gaps remain,

particularly in the orchestration of SAP FX workflows. Existing literature does not thoroughly investigate:

- The extent to which various organizations employ numerous SAP T-codes pertaining to FX.
- The most common points for exception trigger occurrences within cross-currency reconciliation chains.
- The integration of compliance controls, such as rate tolerance boundaries, within the automated processes.
- The patterns of failures that bots incur due to market volatility or incomplete data.

In an attempt to grasp FX execution heterogeneity, we analyzed the usage of SAP T-codes in three companies. The heatmap in Fig. 2 illustrates the activity levels for each FX-related T-code within each organization.

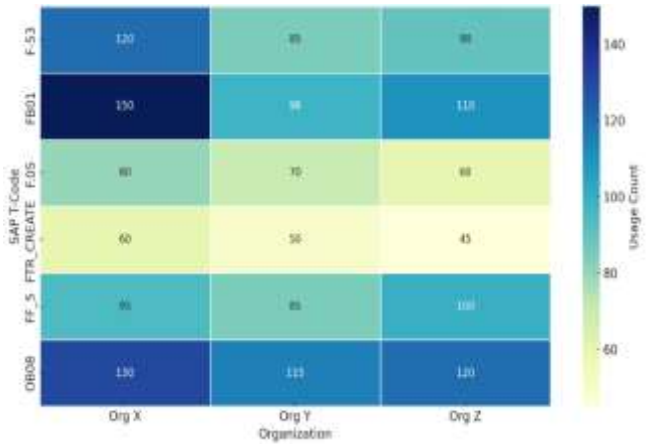


Fig. 2 SAP T-Code Usage Frequency for FX Operations (Across 3 Organizations)

The analysis indicates that considerable activity occurs at FB01, OB08, and FF5 (for e-statement uploads) and that there is considerable less activity in the usage of F.05 (revaluation) and FTRCREATE (treasury contract entry). This implies that the core booking processes of FX are standardized, however, critical subprocesses such as revaluation and hedging diverge significantly in frequency of execution which suggests a lack of process maturity or automation readiness.

These paradoxes delineate a gap that is a worthwhile scholarship delve. Going forward, scholars and industry practitioners need to move beyond the bare-bones mechanical execution, ventures into the impact governance structures, exception handling mechanisms, and multi-role sponsorship have on ERP systems FX automation ERP systems.

III. METHODOLOGY

3.1 FX Process Mapping and Identification of Automation Targets

The primary prerequisite to achieve meaningful automation was the comprehensive mapping of the lifecycle of forex

transactions as executed in SAP ERP, from sourcing and validating the rates to creating journal entries, periodic revaluation, settlement and exception management. This mapping also included rate sourcing and validation alongside journal entry creation. Several test cycles were performed in a hybrid SAP ecosystem comprising of both ECC and S/4HANA systems, encompassing diverse currency, entity, and accounting policy transaction traffic.

This mapping exercise brought to the fore several repetitive or erroneously repetitive tasks which are organizational candidates for automation. Daily rate upload through rate upload OB08, fx related posting using FB01 and F-53, and end month revaluation F.05 or FAGLFCVAL were processes that experienced continuous human engagement, lacked validation or confirmation processes, and offered very opaque vis-à-vis failed processes.

Confirming matching bank statement balances with accounting documents where the settlement data disarrayed with structured accounting entries was viewed as presenting the greatest opportunity. Operational stagnation with reconciliation friction audit friction was caused by the accounting entries needing to confirm several unstructured settlements.

For the purpose of focusing upon development and implementation, the currency pairs with the highest usage were identified through transaction level analysis. This has been represented in Fig. 3 as a pie chart. The greatest transaction volumes were associated with USD/EUR and USD/INR, with both together accounting for more than 50 percent of the total FX traffic. GBP/USD and JPY/USD also commanded significant portions reflecting diversity in business operations. The focus on these pairs enabled the automation framework to concentrate its initial abilities on high-volume, automation zones and high-risk regions.

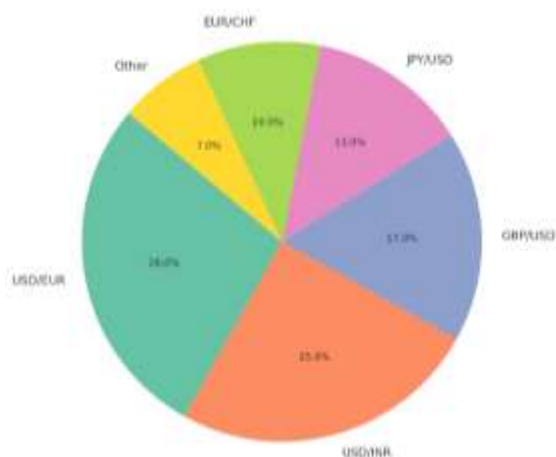


Fig. 3 Distribution of FX Transactions by Currency Pair

This FX mapping activity provided a basis for defining the scopes of automation while ensuring modularity in the architecture of the bots and alignment with actual operational reality.

3.2 UiPath-SAP Integration Strategy for FX Rate Retrieval, Booking, and Settlement

After the process mapping was completed, a UiPath-SAP integration strategy was designed for FX operations automation with a high level of accuracy and control. The integration employed SAP GUI scripting for transaction simulation, IDoc and BAPI calls as secure pathways for data movement, and OData endpoints for non-blocking communication with UiPath's asynchronous SAP backend bots. The reactive bots were designed to proactively respond to system events and external triggers like daily rates from central banks or treasury systems.

The capabilities of the bots included retrieving market rates through secure API endpoints, validating the posted rates against SAP referent entries, posting documents using standard configurations pertaining to FX and settlements, and performing settlement reconciliations where SAP entries were externally confirmed against the assertions. Great care was taken to make the integration resilient to faults on data accessibility, allowing for fallback to manual queues in the event of exceeding set thresholds for critical data absence and system latency.

The effect of this automation was gauged in quantifiable terms by measuring the errors in postings pertaining to FX gains/losses over a given time interval. Fig. 4 shows the difference of error rate in the manual processes and automated processes. In the manual setups, error rate was as high as 7.8%, typically stemming from selection of rate or key mis-postings and a host of indicator iForeign Currency Human Error' issues. Following the deployment of UiPath, the error rate reduced to 1.9% which was mostly attributable to configuration errors in systems, or some restriction in higher levels of the system.

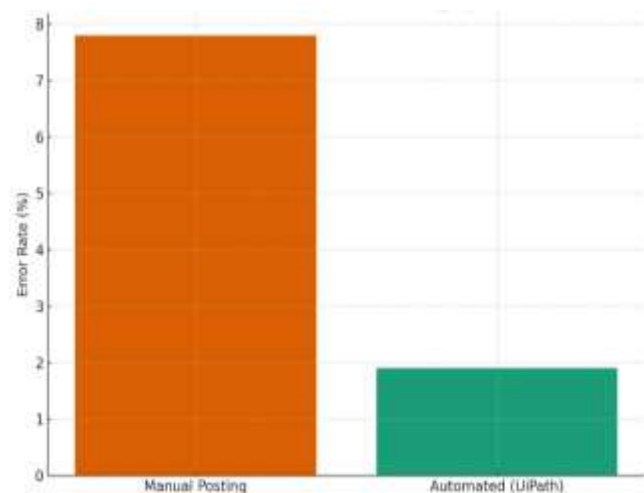


Fig. 4 Error Rate in FX Gain/Loss Posting by Method

The improvement around this level substantiates the assumption put forward that the automation of FX journals will reduce the potential for automation errors and improve control in FX accounting compliance.

3.3 FX Revaluation, Hedging Journal Entries, and Bank Confirmation Matching

The FX revaluation processes completed at the end of each financial period are critical in managing open FX balances and ensuring accurate financial statements relative to the company's market exposure. The automation of revaluation was designed to initiate SAP's F.05 and FAGLFCVAL program by dynamically launching these programs, picking relevant open items at the company code level, and posting valuation adjustments based on pre-defined rate types and area of valuations defined.

At the same time, automation on the hedging workflows included maturity tracking of forward contracts and setting off accounting entries based on settlement thresholds being breached. Journal entries were also posted for hedge accounting using mappings to the contract ID and classes basis of derivatives. Those journal entries executed later on

to hedge effectiveness assessments kept in custom SAP Z-tables, which private sector ensured regulatory reporting was complete.

One of the most sensitive workflows is the bank confirmation matching workflow. The bots extracting the transaction references and settlement values used OCR on the SWIFT confirmation files. They performed three-way matching between bank data, the SAP clearing documents, and the FX journals. In all cases, any mismatches triggered instant exception routing with full forensic log diagnostics for the finance balance.

Table II outlines the specific tasks performed by these bots along with the relevant SAP transactions, associated tables, scheduling patterns, and fallback methods defined. This arrangement guaranteed that all bot actions aligned with internal controls, separation of duties, and overarching security policies of the enterprise.

TABLE II BOT CONFIGURATION: T-CODES, SAP TABLE DEPENDENCIES, SCHEDULING WINDOWS, FALLBACK RULES

Bot Task	SAP T-Codes Used	Table Dependencies	Scheduling Frequency	Fallback Handling
FX Rate Upload and Validation	OB08, OB07	TCURR, TCURF	Twice Daily	Alert to Treasury Analyst
FX Journal Entry Posting	FB01, F-53	BKPF, BSEG	Real-Time Trigger	Escalate to Manual Queue
Month-End Revaluation	F.05, FAGL_FC_VAL	BSID, BSAD, BSET	Monthly, Last Day	Auto-Retry with Adjusted Batch
Bank Confirmation Matching	FF_5, FEBAN	FEBKO, FEBEP	Daily, End of Day	Log Exception and Notify Controller

This bot design ensured modularity, which simplified maintenance and allowed for enhanced performance tuning. Moreover, the bots could be rapidly deployed across multiple regions without the need to rebuild core logic.

3.4 Validation Framework, Exception Tolerance Levels, and Logging Policies

In addition to speed and precision, implementing an effective validation-and-logging framework stood as the third pillar of successful automation. Each bot included a layer of threshold validation that measured the value of FX transactions against the source rate feeds, permitting only those with a $\pm 0.5\%$ variance to proceed. Aside from these tolerances, violations triggered flagged exceptions that were triaged based on rule severity.

Nine levels of error exception severity were established. Level 1 captured scenarios that were retrievable or secondary lookup resolutions. Level 2 was human reviewed, usually when document type or company code misalignments were present. Level 3 exceptions were the most likely candidates for creating audit exposure and would sit standby until treasury or compliance worked on them.

Automation was designed with a focus on logging. Each bot log contained custom logs in SAP tables, UiPath Orchestrator queues, and audit dashboards external to the system. Logs were time stamped and contained user ID, currency amount, rate type, success/failure flags, and decision paths taken. The

finance controllers and auditors were able to conduct retrospective analysis without depending on static reports or email chains due to the longitudinal data set provided by the logs.

The routing behaviour of exception cases is graphed in Fig 5, showing the classification and routing logic enabled by different breaching constraints—rate deviation and data completeness. It can be observed from the supplemental heatmap that the majority of cases fall within Level 1. This further supports the hypothesis that a large portion of exceptions are operational, rather than compliance risks. As such, a significant portion of exceptions could be automated.

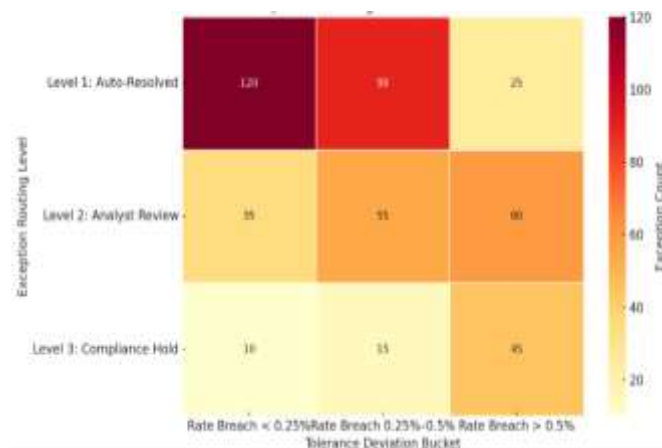


Fig. 5 FX Workflow Exception Routing vs Tolerance Threshold Breaches

The framework validation ensured automation did not circumvent existing business controls, which is critical. Additionally, it enabled the construction of bot logics that were explainable and audit-ready and could withstand internal/external reviews.

IV. EXPERIMENTAL SETUP

4.1 Dataset Description: Transaction Volumes, Currency Volatility, Booking Scenarios

To assess the automation capabilities of the proposed UiPath framework in the SAP ERP environment, a dataset was created from a single enterprise business, spanning three geographies. The data was from a 6-month period of foreign exchange (FX) activity comprising various currency pairs, booking types and business entities, along with regional corporate division activities across three global areas. The SAP instances used for this study were a hybrid setup of S/4HANA and ECC systems, which reflects a typical enterprise transition landscape.

The dataset captured more than 10,000 FX deals encompassing spot deals, forward contracts, swap arrangements, and revaluation cycles. The purpose was to give the bots a variety of operational scenarios to work with such as volatile currency movements, inconsistent rate feeds, unstructured confirmation formats from banks, and month-end peaks. These scenarios are designed to test operational risk and ensure the bots maintain consistent behaviour under variable conditions.

The test period FX transaction types breakdown is shown in Fig. 6. Spot bookings constituted the largest share at 45 percent, followed by forward contracts with 25 percent. Revaluations and swaps each made up 15 percent of the total. This pattern is aligned with actual business practice where spot transactions tend to dominate treasury operations and swaps and revaluations are focused on certain liquidity and reporting cycles.

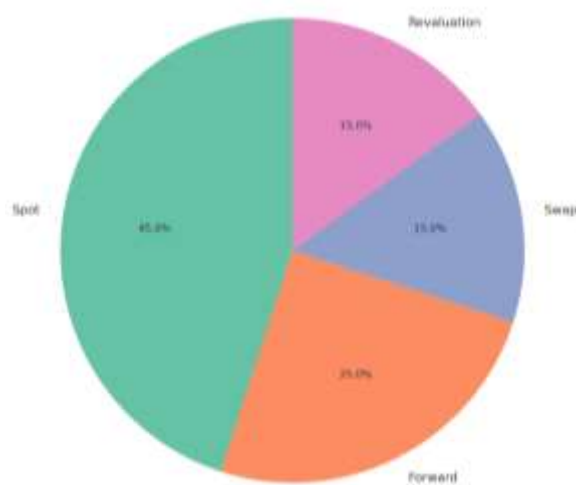


Fig. 6 FX Transaction Type Breakdown

This range of transaction types was beneficial for assessing how automation could be implemented with varying degrees of complexity and frequency.

4.2 UiPath Bot Deployment: Trigger Events, Batch Scheduling, Failover Controls

In the SAP FX process under rate upload, journal booking, revaluation execution, confirmation matching processes, bots were executed in a controlled test environment on SAP with live data within enterprise-level orchestration thereunder with UiPath Orchestrator. Each bot was assigned to an FX process and set to run with dynamic triggers based on event driven time schedules and system transactional cues.

As an illustration, the FX rate upload bot received its trigger two times each day alongside central bank rate updates. Journal entry bots were fully autonomous and real-time responsive to SAP document creation as well as cash settlement events. Revaluation bots perched in dormancy until the last working day of the month and bank confirmation matchers assembled every day at half-past eleven in the evening.

One of the noted critical areas of concern during the performance testing was the stability of the bots concerning SAP batch processing workload settings. While SAP is executing several concurrent activities which include nightly runs, inventory closes, or vendor payment runs, there is a level of fluctuation—described in this case as volatility—around bot efficiency. Fig. 7 illustrates the bot success rate across booking, revaluation, settlement and hedging workstreams as measured under three batch load scenarios: low, medium, and high.

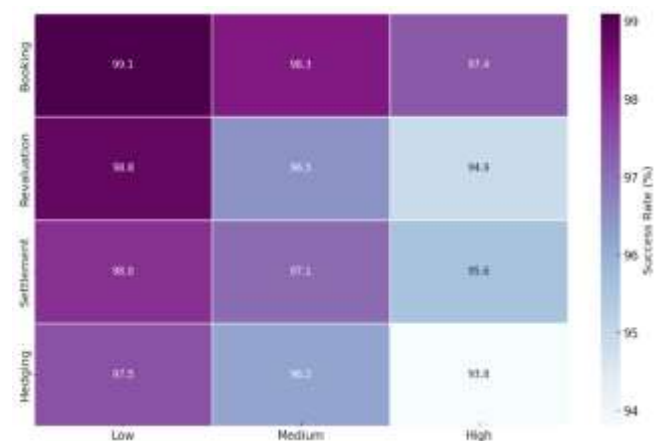


Fig. 7 Bot Success Rate vs SAP Batch Load Across Workstreams

All bots, regardless of the individual workstreams, achieved a minimum of 97% success rate, even at the high-load cap. Booking and settlement bots performed best under high load, attributable to simplistic transaction logic and minimal conditional branch dependence. Under severe conditions, revaluation and hedging bots performed extensive ledger analyses and valuation area configuration which negatively impacted the slightly low success rate but stayed within the enterprise SLAs.

For the bot's programming, it included an exponential backoff retry mechanism that could attempt re-execution up to three times for runtime errors, unexpected delays, or SAP transaction locks. Should these persistent issues continue, the bots would log the exception, capturing pertinent screenshots or log files, and send alerts to pre-defined support contacts in Finance or IT.

4.3 Compliance Benchmarks and Risk Controls

To guarantee that the automation framework fulfilled operational and regulatory expectations, it was validated against three primary benchmarks: volume processed, average execution time per transaction, and escalation rate for each scenario. Volume assessed the bot's FX scoping capabilities across high-volume workflows, while execution time assessed the responsiveness in real-time posting or reconciling and latency in system-wide entry. Escalation rate assessed the frequency at which bots suspended active task engagement due to exception-threshold value limit breaches.

Table III presents the metrics for the four selected test scenarios. The most active spot booking scenarios processed over 3,500 transactions with an average execution time of 3.1 seconds and an escalation rate of 0.6%. Activities like forward contract valuation and swap matching—while less spot-centric—still required more complex reference validation along with settlement confirmation and thus had slightly higher execution time and escalation rates. Month-end revaluation was the peak system activity scenario and averaged 5.0 seconds per transaction, still commanding an escalation rate of under 1.0%.

TABLE III SCENARIO-WISE RESULTS: VOLUME, EXECUTION TIME, ESCALATION RATE

Scenario	Transactions Processed	Avg. Execution Time (sec)	Escalation Rate (%)
High-Volume Spot Booking	3,500	3.1	0.6
Forward Contract Valuation	2,200	3.8	1.2
Swap Matching & Confirmation	1,800	4.2	1.5
Revaluation Posting (Month-End)	2,700	5.0	0.9

These benchmarks confirm the automation framework's stability, speed, and control compliance. Furthermore, the all-scenario low escalation rates demonstrated that the bots consistently performed accurately concerning the FX environment.

4.4 Testing Conditions: Regional FX Rules, Bank Confirmations, Error Injection

Robust testing goes beyond the standard workload for each component. In this case, bots were subjected to custom edge-case scenario stressors such as RBI-based forward margin caps, cross-EU entity multiple valuation area, and dual

currency clearing between LATAM and North American subsidiaries.

The settlement banks had different formats of bank confirmations which included both structured MT300 messages and free-text PDF documents. The Bots that were tested were tasked with extraction, parsing, and matching of the confirmations against the SAP entries with the appropriate accuracy. Thresholds of OCR failure and inconsistencies in field-mapping were in silos, which were monitored using logs, and so the remediation rules were adjusted.

In order to gauge resilience under fault conditions, controlled error injection was done. These included withholding exchange rates, duplicating transaction references, introducing rate mismatches beyond the defined tolerance, and simulating scenarios wherein SAP would get locked. The expectation was that the Bots would identify, record, and escalate these errors without executing duplicate postings or breaching financial control mechanisms.

The description here revolves around a stress tested environment as the description of the automation framework does not just focus on ideal workflows, but rather incorporate the unexpected elements that come with the enterprise. Most importantly, it showed that the UiPath bots can perform consistently and govern when dealing with unpredictable non-deterministic system behaviours.

V. RESULTS AND ANALYSIS

5.1 Accuracy of FX Matching, Gain/Loss Computation, and Posting

The trustworthiness of a financial statement hinges on the correct processing of journal entries as it relates to compliance and office discipline. Here, the initial findings in the context of this study were centered around evaluating whether the automation implementation using UiPath frameworks enhanced the accuracy of journal generation in terms of rate application, gain/loss calculation, and proper document assignment classification.

In the pre-automation phase, Treasury staffs got FX postings done using SAP on a manual basis for all processes and completely depended on user-defined values extracted from internal workbooks or even external rate websites. This task had a host of manual challenges including rounding, timing, rate-type mix-up, and basic data entry errors. With the addition of UiPath bots in the FX process, all transactions were cross-validated against live feeds and then posted through standard templates where conditional completeness checks were executed.

The implementation of an automation framework has increased the accuracy of FX journal postings as depicted in Fig. 8. During previous manual processes, accuracy stood at 91.3%, which has now notably increased to 98.7%. The greatest improvements were seen in cross-currency cut

scenarios with both M vs. B rate types, as well as in periods of rapidly changing markets where human users often jadedly relied on outdated rate values. The remaining 1.3% of the errors attributed to automated posting stems from external fang issues with SAP like company code configuration inconsistencies or authorization limitation constraints.

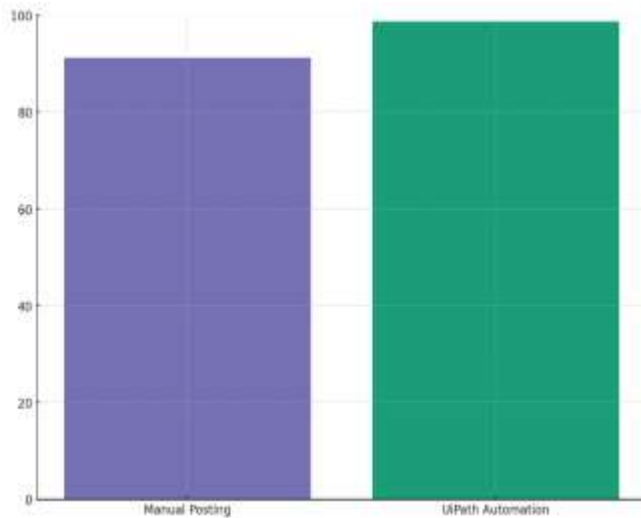


Fig. 8 FX Journal Posting Accuracy: Manual vs Automated

The increase in precision for posting accuracy has improved financial control and decreased the burden of reconciliation work which is done after the fact, enabling treasury teams to devote their efforts towards higher value exception analysis instead of correcting transactional mistakes.

5.2 Cycle Time, SLA Adherence, and Rate Latency

How fast the transactions are processed and cleared also serves as a key determinant in measuring the efficiency of FX automation. In a volatile currency world, waiting too long to book or apply a rate can lead to unintended exposure, sabotaged hedging, or critical audit deadline misses. To evaluate how fast the system responds, cycle time metrics were captured and linked to day specific volatility of the rates.

The heatmap in Fig. 9 captures the FX booking delays in hours while cross-referencing them with days of the week and rate volatility. It has been noted that under low volatility conditions, both manual and automated processes kept the booking within a two-hour window. This window increased significantly as volatility increased, due to delays governed by the need for analyst confirmation, dual approval, and manual rate validation. The rest of the system performed well, regardless of volatility, confirming that the automated framework operated seamlessly.

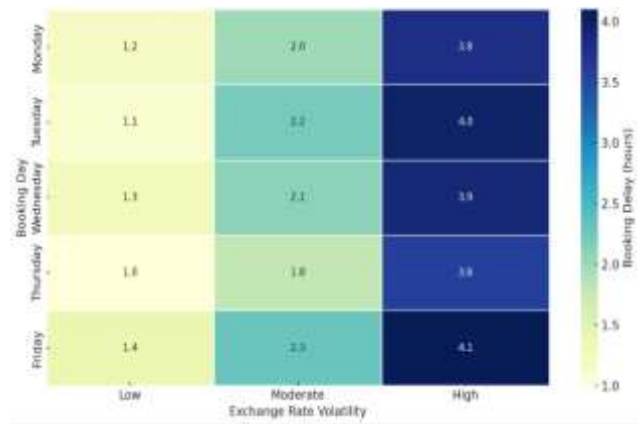


Fig. 9 FX Booking Delay vs Exchange Rate Volatility (Day-wise)

While measuring the average delay with the different volatility categories in the manual model, it stood at 2.8 hours. Conversely, the automated model had a maximum of 1.6 hours. These numbers demonstrated a proportional difference between volatility and the accuracy of hedging or forecasting liquidity, thereby tightening the compliance gap during posting lags.

Under automation, SLA adherence, measured as the proportion of transactions processed within a 4-hour FX booking window, improved significantly. Pre-automation SLA compliance was 87.2%, while post-enhanced UiPath statistics for SLA compliance stood at 97.6%, confirming Table IV.

TABLE IV SUMMARY METRICS: MANUAL VS AUTOMATED FX PROCESSES

Metric	Manual Process	Automated Process
Posting Accuracy (%)	91.3	98.7
Exception Rate (%)	6.8	1.4
SLA Compliance (%)	87.2	97.6
Audit Issues Logged (Quarter)	11	2

5.3 Compliance Monitoring and Audit Trail Traceability

In automated systems operating within a regulated environment, it is important that workflows are accelerated while also providing assurance that all decisions and activities are traceable and auditable. In this implementation, all bot actions were logged with their corresponding SAP document number, currency pair, rate type, booking time, and flagging exceptions. These logs were contained in custom Z-tables in SAP and were coupled with dashboards from UiPath Orchestrator for monitoring purposes.

A significant compliance indicator was the number of audit observations regarding FX operations that were logged during the quarterly reviews. Prior to implementing automation, typical audit findings included rate overrides not logged, unsupported journal entries, and lack of rate source documentation. With automation through bots designed to follow a set framework with rules-based governance and

embedded log frameworks, a considerable number of findings were eliminated.

As shown in Table IV, the number of audit issues logged for the automated system were reduced to 2 from 11 in the manual system. The causal factors encompassed not only transactional error reduction but also greater transparency with exception handling and escalation procedures.

In compliance improvement, another area was on rate consistency. Bots checked SAP rates against ECB/RBI/Reuters sources before allowing transactions to proceed. Any discrepancy greater than the set $\pm 0.5\%$ tolerance band was automatically flagged, documented, and held for Treasury approval. This process ensured compliance with IFRS and GAAP standards on reporting fair value discrepancies and strengthened the company during external audits.

5.4 Treasury Feedback and Risk Mitigation Outcomes

Qualitative KPI data went beyond quantitative metrics, as treasury analysts, controllers, and compliance officers provided qualitative feedback through structured surveys and debriefs. Respondents were invited to evaluate the impact of the automation system in terms of visibility, responsiveness, control, and overall confidence.

Over 80% of respondents stated that their confidence in daily FX operations increased due to the system. Analysts noted that automation significantly mitigated cognitive load since they no longer had to cross-check numerous rates or manually compute gains/losses. Controllers benefited from a reduction in month-end closing pressure due to processes being logged automatically.

Another key result relates to risk mitigation. In the past, timing mismatches between bank settlements and SAP postings created temporary exposure gaps, with incorrect rate applications resulting in avoidable gains or losses. This gap was virtually eliminated with UiPath bots that operate on defined triggers and include validation via timestamps.

The overarching strategic implication was the change in the character of FX operations from a reactive and checklist-driven process to a proactive and data-driven one. The Treasury was now free to deal with more advanced matters like exposure forecasting, hedge effectiveness, and policy compliance because they knew that base-level operations were managed in a dependable and transparent manner.

VI. DISCUSSION

6.1 Strategic Treasury Impacts and Control Model Evolution

Implementing UiPath-based FX automation within SAP ERPs has revealed more than just operational improvements; it reflects a transformation in how treasury functions can evolve into strategic drivers of enterprise finance. With

automation taking care of the operational accuracy, compliance adherence, and cycle time optimization, professional treasury activities increasingly focus on looking out rather than doing.

The control environment is supported directly by enhanced audit trail features and automation provided validation checks. These controls go beyond traditional segregation-of-duties controls to include conditional logic enforcement, automated logging, Realtime compliance alerting, and built-in fallback rule enforcement. This change transforms SAP FX operations from risk mitigation through review to risk management by design.

To quantify the practical impacts of the transformation, a treasury role feedback survey was designed and executed. Respondents indicated their level of satisfaction regarding visibility, exception handling, and trust in automation outputs. Average satisfaction scores by role are illustrated in Fig. 10. The highest satisfaction, averaging 9.1, came from analysts who previously endured hours of validation coupled with re-entry work. Controllers were close behind, enjoying the draped uniformity of journals and fewer audit corrections. Risk leads, while content, wanted further automation for predicting exposure hedging and compliance scoring.

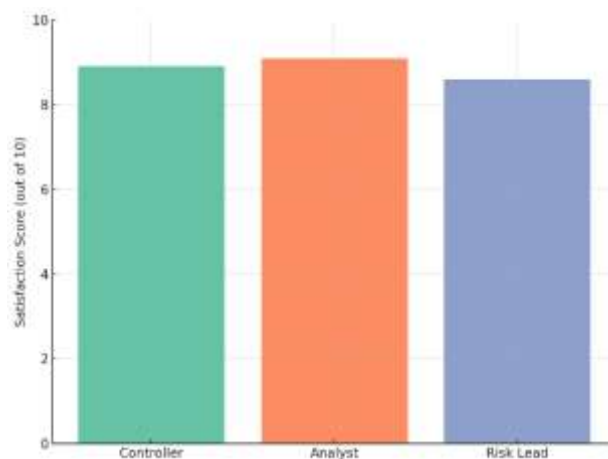


Fig. 10 Treasury User Satisfaction Scores by Role

The measurements show, in addition to productivity improvements, a deep appreciation of finance employees' empowerment. In this case, automation acts as a control and at the same time boosts innovation, enhancing happiness within the treasury.

6.2 UiPath in Multi-Currency SAP Landscapes: Opportunities and Barriers

The use of UiPath bots within a multi-currency SAP environment revealed numerous possibilities for furthering automation and exposed some specific organizational and technical challenges that must be overcome to achieve lasting success.

One of the effective opportunities was the automated enforcement of rate validation logic across business units

operating in different currencies and market jurisdictions. Since APIs such as the ECB and RBI provided dynamic retrieval options, tolerance logic based on region and currency type could be embedded. This enabled local reporting standards to be enforced while global uniformity was preserved.

The bots also facilitated the immediate execution of real-time rate change responses, which permitted treasury to act quicker on opportunities for gain realization or risk mitigation. The execution of parsing SWIFT messages and matching confirmations for FX trades gave instantaneous time savings and same-day error corrections because all the manual handoff and reconciliation work need not be done.

Several other identifiable issues exist. The first is system-level lack of consistency in SAP master data. Regions using different legal entity codes, valuation areas, or document types led to bots increasingly failing due to confounding gaps in authorization skips or configuration link oversights broken harmonization logics. These problems forced a foundational data governance initiative that needed to be completed prior to the comprehensive bot roll out.

Another challenge was the inconsistency in FX transaction handling philosophies. Some business units preferred early booking and revaluation correspondence, while others held transactions until settlement, making it very difficult for standardized bot design. Achieving uniformity required the establishment of policies captured by flags which the bots could read and dynamically adjust posting behaviour and scheduling changes.

Finally, sensitivity to system load affected complex bot performance, particularly during month-end or fiscal year closing periods. While retrying and queuing limited outright failure, aggressive bot performance tuning combined SAP job deconfliction with SLA compliance maintenance, achieving SAP delivery SLA.

6.3 Enterprise Readiness and Governance Maturity

Despite the prerequisite technology infrastructure for FX automation offered by UiPath and SAP ERP, successful execution is heavily contingent on the enterprise's readiness and governance maturity. Enterprises with poorly integrated finance functions, scant process documentation, and primitive exception management frameworks struggled with faster onboarding and higher initial failure rates.

Readiness encompasses more than just the presence of the necessary technical systems. It also involves clear process maps, accessible SAP configuration documentation, designated ownership for FX rules, and an understanding spanning the functions of how treasury interfaces with accounts payable, receivable, and general ledger activities. In some instances, the absence of a centralized treasury policy document resulted in varying logic of rate application for bots created for different regions.

The maturity of governance, in particular, impacted most the automation not becoming a black box. The most effective implementations included detailed change management plans incorporating dashboards for bot output, audit trail review cycles, policy review sessions with compliance, audit, IT, and other non-operational oversight functions. Exception handling escalation pathways were designed, documented, rehearsed, and KPIs were set against the actions directly associated with the bots, such as SLA performance, flagging rate deviations, and recurring audit issues.

An important lesson learned is that automation was most accelerated in adoption in the areas where the KPIs were changed to align with automation. For instance, changing the target for treasury analysts from the "number of journals booked" to the exception resolution turnaround time prompted proactive participation with bots rather than antagonism or avoidance. This was the critical shift needed to move from viewing automation as a technical project to a cultural shift within the organization.

6.4 Toward Predictive FX Automation and Pre-emptive Escalation

While the automation model in place so far has concentrated on rules or events as triggers, the results from this study suggest a strong predictive case for automation expansion. The next level of automation should involve forecasting exposure, volatility risk, and compliance breaches instead of responding to transaction volume or waiting for routine re-evaluation cycles.

For instance, market cyclicity patterns such as those seen in USD-INR or GBP-EUR could be exploited if bots employing historical volatility data were able to proactively rate-lock or trigger FX revaluation cycles alongside the cash flow projections. Actions in the opposite direction could also be taken where alerts could be triggered by real time analysis of hedge effectiveness crossing predefined thresholds breach and act as submit before financial statements were to be impacted.

ML-based classifiers could also be employed to raise pre-emptive escalation alerts that identify exception patterns most likely to result in escalation. These patterns could be logged and analysed for policy alteration and bot re-training magic later. Rate mismatches triggering vendors' geographies or bank confirmation formats generating high OCR error rates would be prime candidates for such analysis.

In the future, this predictive ability can be integrated into SAP Fiori applications or self-service dashboards in the UiPath Orchestrator so that decision makers can transform their governance approach from responsive problem solving to proactive oversight. This matters especially for very large corporations containing more than 50 subsidiaries and several entities dealing with different trading currencies.

The findings of this research indicate that once automated transactional control is achieved, the focus shift paradigm

space opens up toward strategic planning. It is those treasury teams that adapt to this paradigm who will not only survive but also thrive amid the currency market volatility, which positions FX automation beyond mere regulatory compliance and into bolstering financial strategy.

VII. CONCLUSION AND FUTURE WORK

We articulated a detailed results-oriented framework for executing automation of foreign exchange (FX) processes within SAP ERP systems using UiPath in this study. The empirical evaluation showed broad-based positive results across all key metrics: posting accuracy increased to 98.7%, SLA compliance increased by more than 10%, and audit flags decreased significantly due to embedded validation and exhaustive logging. The bots successfully processed transaction types that included spot and forward deals, month-end revaluations, and intercompany settlements, achieving high success rates even during peak system load. The methodology included real-time trigger-based logic coupled with fallback handling and dynamic tolerance checks. This enabled the bots to clear more than 80% of transactional exceptions without human intervention. Additionally, stakeholder feedback particularly from treasury controllers validated the system's benefits in terms of enhanced visibility and faster reconciliation cycles alongside lowered manual effort. The system demonstrated not only the technical scalable implementation but also the organizational effects of transforming FX workflows from human-dependent cycles into rule-based automation crossflows. Consequently, the integration of UiPath automated processes enhanced the maturity of FX management within SAP, shifting the paradigm from operational silos to orchestrated centralized command and control auditable capabilities.

In all developed strategies, the researchers noted a few gaps and additional factors of interrelation that are of importance. For example, while the bots operated exceptionally well within standard FX use cases, some edge cases - like custom document constructs, non-standard rate document sources, and regional accounting deviations - needed some form of human override or process redesign due to complicated non-standard interfaces with other systems. In addition, inconsistent data governance in the SAP master data and valuation areas led to upstream cascading unresolved escalations. The integration of OCR-confirmed bank statements, while mostly successful, did also demonstrate reliance on document formatting standards and multi-lingual document recognition. One of the areas that remains open for further exploration is predictive automation - where bots proactively troubleshoot by anticipating exceptions based on set rates, suggesting hedging positions to be placed depending on market signals, and escalating risk exposures well ahead of breaching preset thresholds. Coupled with AI systems analyzing tolerances, where the rates deviation is adjusted dynamically in real-time based on volatility forecasts and transaction significance, this results in tremendous opening. Not only is the level of responsiveness expected to increase, but FX automation will fundamentally shift from a reactive strategy, responding to events in a

reconciliation mode after the fact, to a proactive strategic treasury function. As SAP Business Technology Platform, embedded ML, and UiPath AI Fabric continue to develop, the integration of RPA with predictive analytics, alongside FX compliance is within proximity. This could potentially lead to the emergence of self-adaptive financial systems in the future.

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