

IMPACT OF ROBOTIC PROCESS AUTOMATION ON COST REDUCTION AND PROCESS ACCURACY

Nikita Katti, Dr Kali Charan Sabat

¹MBA Finance and Business Analytics Student, Dayananda Sagar College of Engineering, Bengaluru, India

²Professor, Department of Management Studies, Dayananda Sagar College of Engineering, Bengaluru, India

Abstract - Robotic Process Automation (RPA) has become an important approach to automating repetitive, rule-based and high-volume business activities across modern organizations. This study examines how RPA contributes specifically to cost reduction and process accuracy, two outcomes that strongly influence the business case for automation. The paper adopts a structured literature-review approach and synthesizes findings from peer-reviewed studies and research reports on RPA, business process automation and organizational implementation. The review indicates that RPA can reduce operational costs by lowering manual effort, shortening processing time, increasing throughput and supporting continuous execution of standardized tasks. The literature also indicates that software bots can improve process accuracy by executing predefined rules consistently and reducing errors associated with repetitive manual data entry and transfer. However, these benefits are not automatic. Poorly selected processes, unstable applications, weak governance, inadequate exception handling and insufficient change management can reduce or even offset the expected value. The study therefore proposes that organizations evaluate RPA using a combined cost-and-accuracy framework rather than treating automation only as a headcount-reduction initiative. The findings provide practical guidance for managers seeking to prioritize RPA opportunities and establish measurable performance indicators.

Keywords: Robotic Process Automation, cost reduction, process accuracy, operational efficiency, business process automation, digital transformation.

1. INTRODUCTION

Organizations are under continuous pressure to improve operational efficiency while maintaining quality, speed and control. Many administrative and back-office processes still depend on repetitive activities such as data entry, data validation, reconciliation, report preparation, invoice processing, employee record updates and movement of information between enterprise applications. These activities are often rule-based and consume employee time without necessarily requiring high levels of judgement. Robotic Process Automation (RPA) has emerged as a technology for automating such activities through software bots that interact with existing applications in ways similar to human users.

RPA differs from traditional physical robotics because the automation takes place in software environments. Bots can log into applications, read structured information, copy and transfer data, perform calculations, validate predefined conditions and generate outputs. Earlier research describes RPA as an approach aimed at improving process efficiency and reducing process

costs, while also emphasizing the need to determine which tasks should be automated and which should remain under human control [1], [2].

The economic argument for RPA is closely associated with cost reduction. Organizations may reduce the amount of manual effort required for repetitive transactions, reduce overtime and rework, increase processing capacity and redeploy employees toward higher-value activities. At the same time, process accuracy is a major expected benefit because a bot can apply the same programmed rules repeatedly without fatigue or variation. Case evidence from early RPA adoption has reported faster and more accurate routine back-office performance and substantial returns on investment [3].

Nevertheless, RPA should not be viewed as a universal solution. Automation can reproduce an inefficient process if the process itself is not understood or standardized. Exception-heavy workflows, frequent application changes, poor-quality input data and weak governance can increase maintenance requirements. Recent literature also shows that RPA research has expanded beyond simple efficiency claims toward process selection, implementation life-cycle management, performance measurement, technology integration and organizational governance [4].

This study therefore focuses on two connected outcomes: cost reduction and process accuracy. The purpose is not to claim a universal percentage improvement for all organizations, but to synthesize the conditions under which RPA is most likely to generate these benefits and the factors that can limit them.

2. OBJECTIVES OF THE STUDY

- To examine the relationship between RPA adoption and operational cost reduction.
- To analyze how RPA influences process accuracy and the incidence of manual errors.
- To identify the major process characteristics that determine whether RPA can deliver measurable benefits.
- To identify implementation challenges that may reduce the expected cost and accuracy benefits of RPA.
- To propose a practical framework for evaluating RPA initiatives using cost and accuracy indicators.

3. RESEARCH METHODOLOGY

This study uses a structured literature-review methodology. The research does not report primary survey or experimental data;

instead, it synthesizes published academic literature on RPA, process automation, operational efficiency, cost and accuracy. Sources were selected based on relevance to the study objectives, academic credibility and direct discussion of RPA outcomes, implementation or organizational implications. The literature base includes foundational RPA research, structured and systematic reviews, and documented organizational case evidence.

The review process involved four stages. First, the study defined the key concepts: RPA, cost reduction and process accuracy. Second, relevant literature was screened for evidence concerning efficiency, processing time, manual effort, errors, quality and financial outcomes. Third, findings were grouped into thematic categories. Finally, the themes were synthesized to identify common benefits, limitations and managerial implications. This approach is consistent with the use of structured literature reviews in RPA research, where prior studies have been organized around themes, challenges, benefits, implementation and future research needs [4], [5].

The principal analytical dimensions used in the synthesis are shown below.

Dimension	Representative Indicator	Expected RPA Effect	Management Interpretation
Cost	Manual hours / processing cost	Lower repetitive manual effort	Measure cost per transaction before and after automation
Time	Cycle time / throughput	Faster execution and higher capacity	Measure elapsed time and transactions processed
Accuracy	Error rate / rework rate	Fewer repetitive execution errors	Track exceptions, corrections and rework
Quality	Consistency / compliance	More standardized execution	Check adherence to predefined rules and controls
Workforce	Employee time allocation	Shift toward higher-value work	Assess redeployment rather than only headcount reduction

Table 1: Analytical dimensions for evaluating RPA impact

4. REVIEW OF LITERATURE

4.1 Concept and Evolution of RPA

RPA is generally understood as software-based automation of structured, repetitive and rule-driven tasks. Van der Aalst, Bichler and Heinzl [1] highlighted the broader managerial question of what should be automated and what should remain with human workers. This perspective is important because automation decisions involve not only technical feasibility but also process design, control and organizational responsibilities.

Syed et al. [4] conducted a structured review of RPA research and identified themes including process automation, service automation, software bots and research challenges. Wewerka and Reichert [5] similarly reviewed the RPA literature and developed a framework for systematically assessing RPA studies. Together, these studies establish that RPA is not simply a software tool; it is part of a broader organizational approach to process transformation.

4.2 RPA and Cost Reduction

Cost reduction is one of the most frequently cited motivations for RPA adoption. The mechanism is not limited to replacing employees. RPA can lower the cost of repetitive processing by reducing manual transaction time, decreasing rework, increasing processing capacity and enabling work to be performed continuously. When a bot handles standardized activities, employees can be redirected to tasks involving analysis, customer interaction, decision-making and exception management.

Evidence from the Telefonica O2 case reported faster and more accurate routine process performance and returns on investment of up to 200% in the case examined [3]. Such case evidence demonstrates the potential business value of RPA, but it should not be generalized into a universal ROI figure. Actual savings depend on transaction volume, labor cost, automation complexity, maintenance requirements, infrastructure and the quality of the process selected.

Recent systematic research continues to identify financial and operational outcomes as important dimensions of RPA performance. A 2026 systematic literature review covering 83 peer-reviewed articles identified operational efficiency, financial quality, strategic value and human capital among the major benefit dimensions of RPA in business process management [6]. This supports the view that cost reduction should be evaluated alongside process quality and organizational outcomes rather than as an isolated metric.

4.3 RPA and Process Accuracy

Process accuracy refers to the extent to which a process is executed correctly and consistently according to defined rules and requirements. Manual repetitive work can be vulnerable to transcription mistakes, omissions, inconsistent application of rules and incorrect movement of information between systems. RPA can reduce these risks when the process is sufficiently structured and the automation logic has been correctly designed and tested.

Lacity and Willcocks [3] documented the O2 case as an example in which RPA improved the speed and accuracy of routine processes. Research on administrative reporting has also examined RPA's potential to improve data accuracy and reduce human error in recurring report-generation activities [7]. The underlying mechanism is consistency: once validated rules are

encoded, the bot applies those rules repeatedly under the same operating conditions.

However, automation does not eliminate all errors. If source data are inaccurate, incomplete or inconsistent, the bot may process that information exactly as instructed. Similarly, poorly designed exception rules can cause transactions to fail or require human intervention. Therefore, process accuracy should be evaluated at the end-to-end process level, not merely by counting successful bot runs.

4.4 Relationship Between Cost and Accuracy

Cost and accuracy are interconnected. A reduction in manual errors can reduce rework, customer complaints, reconciliation effort and exception handling costs. Conversely, an automation that is inexpensive to deploy but produces frequent exceptions may create hidden costs. The business case for RPA should therefore include both direct automation costs and the downstream cost of quality.

A useful management perspective is to evaluate cost per successful transaction rather than only cost per transaction attempted. This approach incorporates rework and exception handling into the economic assessment. Similarly, accuracy should be considered together with processing volume and cycle time. A highly accurate process that is too slow may still fail to meet business requirements.

5. RPA APPLICATION AREAS WITH COST AND ACCURACY POTENTIAL

RPA is particularly suitable where activities are repetitive, rule-based, high-volume, digitally structured and relatively stable. Common application areas include:

- Finance and accounting: invoice processing, accounts payable support, reconciliations, report consolidation and data validation.
- Human resources: employee master-data updates, onboarding administration, attendance-related data processing and routine reporting.
- Procurement: purchase-order data handling, supplier information updates and document matching.
- Customer operations: structured data entry, status updates, case routing and routine notifications.
- Master data management: transferring, validating and synchronizing structured information across enterprise applications.
- Reporting: extracting data from multiple systems, compiling recurring reports and distributing standardized outputs.

The suitability of these areas arises from their repetitive nature rather than from any particular industry. Processes that require complex judgement, negotiation, ambiguous interpretation or frequent policy changes are generally less suitable for unattended RPA.

6. FINDINGS AND DISCUSSION

6.1 Finding 1: RPA Can Reduce the Cost of Repetitive Processing

The literature consistently supports a positive association between RPA and operational efficiency when automation is applied to appropriate tasks [3], [4], [5]. The principal cost mechanism is the reduction of manual effort per transaction. Additional savings can arise through faster processing, reduced rework and improved utilization of employee capacity. However, the financial benefit depends on transaction volume and process stability. Low-volume processes may not justify development and maintenance costs.

6.2 Finding 2: Accuracy Improvements Depend on Standardization

RPA is most likely to improve accuracy when a process has clear rules, stable inputs and well-defined exceptions. Bots provide repeatability, which can reduce variations introduced by repetitive manual work. The literature therefore supports process standardization as an important precondition for reliable automation [4], [6]. Automation should follow process understanding and cleanup rather than simply automate every existing manual step.

6.3 Finding 3: Hidden Costs Can Reduce the Business Case

Implementation, testing, bot monitoring, application changes, exception handling and governance introduce costs that may not appear in an initial business case. RPA can also become difficult to maintain when the underlying application interface changes frequently. Willcocks, Lacity and Craig [8] emphasize the importance of implementation strategy, risk management, change management and building a mature automation capability. These factors determine whether initial automation benefits are sustained.

6.4 Finding 4: RPA Should Complement Human Work

The evidence suggests that RPA should not be treated solely as a mechanism for workforce reduction. When routine tasks are automated, employees can be redirected toward exception management, analysis, customer service and process improvement. This can create a second layer of organizational value beyond direct labor savings. The appropriate objective is therefore to improve the economics and quality of the overall process.

6.5 Finding 5: Measurement Must Continue After Deployment

Organizations should monitor automation performance after implementation. A recent systematic review recommends tracking indicators such as cycle time, error rate, throughput, bot utilization, processing cost, employee satisfaction and return on automation [6]. This supports a continuous-improvement approach in which the automation is periodically reviewed rather than considered a one-time IT project.

7. PROPOSED FRAMEWORK FOR MEASURING RPA IMPACT

Stage	Key Question	Suggested KPI	Decision
Process selection	Is the task repetitive and rule-based?	Automation suitability score	Automate / do not automate
Baseline	What does the manual process cost today?	Cost per transaction, cycle time, error rate	Establish benchmark
Pilot	Does the bot perform reliably?	Bot success rate, exception rate	Scale / redesign
Benefit measurement	What changed after automation?	Cost reduction, accuracy improvement, throughput	Validate business case
Continuous monitoring	Are benefits sustained?	Maintenance effort, downtime, rework, ROI	Optimize / retire / expand

Table 2: Proposed managerial framework for evaluating RPA outcomes

8. CHALLENGES AND LIMITATIONS

- **Process instability:** Frequent changes in applications, rules or workflows can increase bot maintenance.
- **Poor data quality:** Incorrect source data can be processed consistently but still produce incorrect outcomes.
- **Exception management:** Processes with many exceptions can require significant human intervention and reduce expected savings.
- **Governance and control:** Organizations need ownership, access controls, audit trails, change management and monitoring.
- **Employee adaptation:** Automation changes job responsibilities and requires communication, training and reskilling.
- **Overestimation of benefits:** Business cases can be distorted when implementation, maintenance and exception-handling costs are excluded.

The present study is itself limited by its secondary-research design. It does not estimate a single numerical effect of RPA across all organizations and does not claim that every implementation produces the same savings or accuracy improvement. Industry, process complexity, technology maturity and organizational capability can materially influence outcomes.

9. MANAGERIAL IMPLICATIONS

Managers should begin RPA programs with process assessment rather than technology selection. High-volume, repetitive and stable processes should generally be prioritized. Before automation, organizations should document the current process, establish baseline cost and accuracy measures, remove unnecessary steps and define exception rules.

Second, the business case should include total cost of ownership. Development, testing, licenses, infrastructure, monitoring, maintenance and exception handling should be considered alongside direct labor savings. Third, managers should establish a balanced scorecard containing financial, operational and quality indicators. Finally, automation ownership should be shared between business and technology teams so that bots remain aligned with process requirements.

10. FUTURE SCOPE

Future research can strengthen the evidence base through longitudinal case studies and organization-level primary data. Comparative studies could examine RPA outcomes across finance, human resources, procurement, healthcare and public administration. Further research can also examine the interaction between RPA, process mining, artificial intelligence and intelligent document processing. Another important direction is the measurement of employee outcomes, including job redesign, skill development and employee satisfaction. Finally, future studies can develop standardized models for calculating total cost of ownership and return on automation across different process categories.

11. CONCLUSION

Robotic Process Automation has significant potential to improve the economics and quality of repetitive business processes. The literature reviewed in this study indicates that RPA can support cost reduction through lower manual effort, faster processing, greater throughput and reduced rework. It can also improve process accuracy by executing predefined rules consistently and limiting some forms of repetitive manual error. At the same time, the benefits depend strongly on process suitability, data quality, governance, exception handling and organizational readiness.

The central conclusion is that RPA should be evaluated as a process-improvement capability rather than simply as a labor-substitution technology. Organizations can obtain stronger and more sustainable outcomes when they establish a baseline, select suitable processes, measure cost and accuracy together, manage exceptions and continuously monitor performance. A balanced cost-and-accuracy framework can therefore help managers make more evidence-based automation decisions and avoid overstating the value of RPA.

ACKNOWLEDGEMENT

The author gratefully acknowledges the academic literature and publicly available research sources that informed this review.

No primary survey, interview or confidential organizational data were used in this manuscript.

REFERENCES

1. van der Aalst, W. M. P., Bichler, M., & Heinzl, A. (2018). Robotic Process Automation. *Business & Information Systems Engineering*, 60(4), 269–272. <https://doi.org/10.1007/s12599-018-0542-4>
2. Wewerka, J., & Reichert, M. (2021). Robotic process automation—A systematic literature review and assessment framework. *Enterprise Information Systems*, 15(5), 1–26. <https://doi.org/10.1080/17517575.2021.1986862>
3. Lacity, M., & Willcocks, L. (2016). Robotic Process Automation at Telefonica O2. *MIS Quarterly Executive*, 15(1), Article 4.
4. Syed, R., Suriadi, S., Adams, M., Bandara, W., Leemans, S. J. J., Ouyang, C., ter Hofstede, A. H. M., van de Weerd, I., Wynn, M. T., & Reijers, H. A. (2020). Robotic Process Automation: Contemporary themes and challenges. *Computers in Industry*, 115, 103162. <https://doi.org/10.1016/j.compind.2019.103162>
5. Wewerka, J., & Reichert, M. (2020). Robotic Process Automation—A systematic literature review and assessment framework. *arXiv:2012.11951*. <https://doi.org/10.48550/arXiv.2012.11951>
6. Robotic Process Automation in Business Process Management: A Systematic Literature Review and an Integrated Framework. (2026). Business/management literature review, synthesizing 83 peer-reviewed articles published between 2015 and 2025.
7. Palomino Inza, P. D., Siqueros Romaní, M., Linares Grijalva, K. D., & Rodrigue Santos, M. (2025). Impact of Robotic Process Automation (RPA) on the Reporting Efficiency of Administrative Areas: A Systematic Review of the Literature. *LACCEI International Multi-Conference for Engineering, Education, and Technology*. <https://doi.org/10.18687/LACCEI2025.1.1.1289>
8. Willcocks, L., Lacity, M., & Craig, A. (2017). Robotic Process Automation: Strategic Transformation Lever for Global Business Services? *Journal of Information Technology Teaching Cases*, 7(1), 17–28. <https://doi.org/10.1057/s41266-016-0016-9>
9. Bhardwaj, V. (2023). A Systematic Review of Robotic Process Automation in Business Operations: Contemporary Trends and Insights. *Journal of Intelligent Systems and Control*, 2(3), 153–169. <https://doi.org/10.56578/jisc020304>
10. Legito. (2023). Examining the Effects of Robotic Process Automation on Operational Efficiency and Business Process Optimization (Literature Study). *West Science Interdisciplinary Studies*, 1(2). <https://doi.org/10.58812/wsis.v1i2.91>

[Author Name] is a postgraduate student in the Department of Management Studies at Dayananda Sagar College of Engineering, Bengaluru, India. The author's academic interests include business analytics, digital transformation, process automation and emerging technologies in organizational management. This study was prepared as a literature-based research work on the organizational impact of Robotic Process Automation.

BIOGRAPHY