

USING RPA AS A TOOL FOR TESTING

RPA technology allows organizations to easily configure computer software to emulate human actions and execute business processes seamlessly. This software is known as a bot or a robot. RPA is ideal for processes that do not require human intervention. Some notable applications of RPA are insurance policy management, patient analysis and diagnosis, employee onboarding and automated invoice processing.

RPA works with business requirements around process assessment and the corresponding User Interface (UI) integration, underlying backend processes and API/Message layer communication. Most products today use screen scrapping, macro scripts, text analytics, image processing, optical character recognition, and computer vision in RPA to meet the above business requirements.

RPA bridges the gap between business expectations and IT development and helps in extending the life of applications throughout the enterprise especially for legacy systems. This is very critical for achieving Digital Operations excellence. RPA helps organizations improve productivity, operational efficiency, regulatory compliance, automate internal processes, and reduce costs. Moreover, since RPA is non-intrusive and leverages existing infrastructure and underlying

systems, the extent of cost savings is directly related to the level of automation achieved.

RPA services market is expected to reach US \$10+ billion in next 3-4 years. Even so, human intelligence will remain important for certain functions although human decision-making can become challenged

when voluminous data is involved. This is where 'intelligent' process automation comes in. Intelligent process automation (IPA) refers to the application of artificial intelligence (AI) and other technologies like computer vision, cognitive automation and machine learning to RPA.

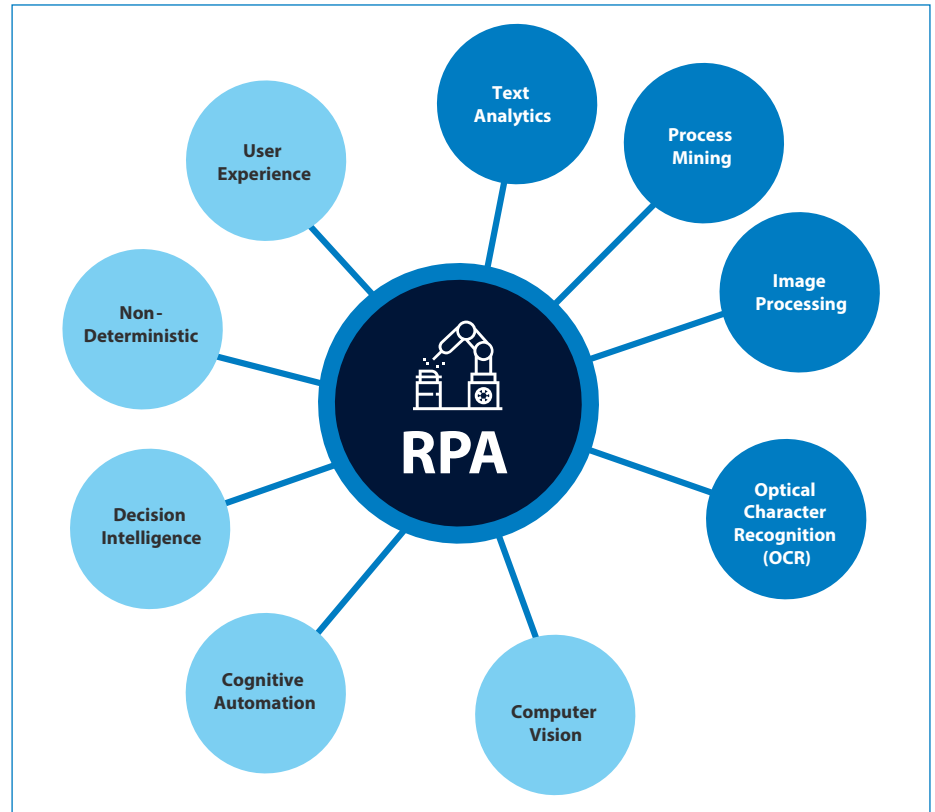


Fig 1: Underlying technologies of RPA

Below is the typical RPA tool architecture

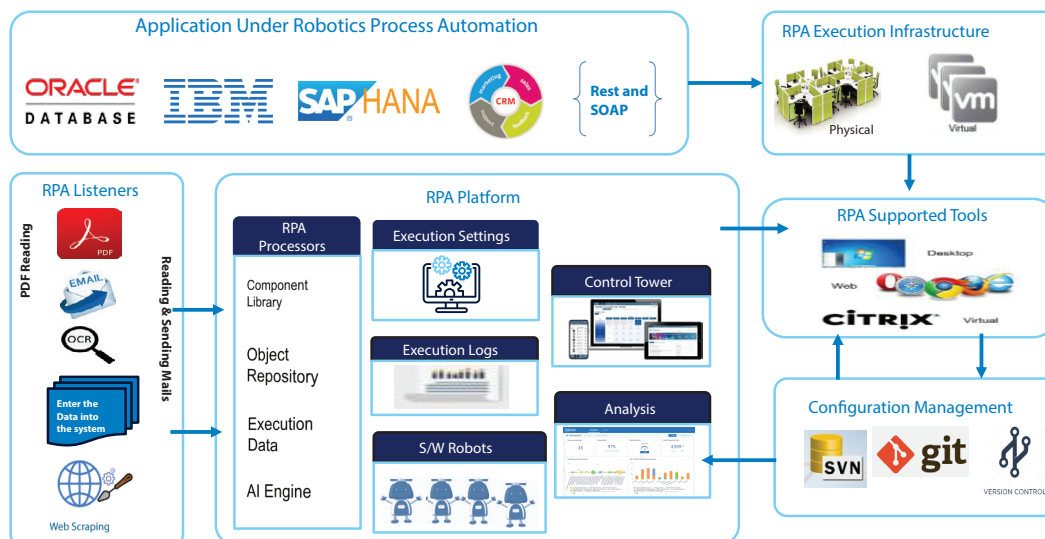


Fig 2: Typical RPA Tool Architecture

The RPA architecture consists of core RPA platform which supports automation of a range of legacy, package and digital applications. Listeners are the applications / components that help in scanning through the input world and feed into the RPA tool, for example PDF readers, Web scrapping tools etc. RPA can run inside VM or on specific desktop. RPA Platform is the central engine drives the entire process; AI can be clubbed inside it.

Validating the RPA implementations will be tricky due to the technical nature of RPA implementation.

The key questions for testing organizations when it comes to RPA testing are:

- How do we test RPA implementations? Can traditional test automation tools be used or are special automation tools needed?
- Can RPA be used to test non-RPA implementations? Will RPA replace the traditional test automation?

1. Testing RPA implementations – Key considerations

Like all software applications, RPA bots, as they are prone to failure, must be independently tested for functionality, performance, security and experience. It is important to ensure high bot quality, and this requires specialized procedures and techniques. Key considerations for Quality assurance of bot are:

- **Functionality** – Input / Output functionality validation of Bot flows across various heterogenous systems, configuration & security validation and Bot stability
- **Bot application exceptions** – How well the bots are designed to handle application errors and exit routes like file exceptions, page not loaded errors, data mismatch, etc.
- **Business process flow errors** – The ability of the bot to handle all data and process combinations. If any exceptions occur at run time, bots should report the error and initiate recovery from the point of failure

- **Environment exceptions** – The quality of the Bots to handle environment instability, changes in environments like screen resolutions, version changes, OS upgrades, etc. In such cases, how the bots is able to self-diagnose the problem, report it and recover from exceptions
- **Integration issues** – This occurs when bots are unable to handle external dependencies, scheduling errors, firewalls, orchestration issues, log management, etc.

Bot validation, a critical part of RPA testing, involves four key areas:

- Process validation to test the bots
- Data management to condition the bots to handle various data combinations and scenarios

- Execution to test the bot’s functionality in the integrated environment
- Exception handling to test the ability of the bot to manage exception conditions

An analysis of various commercial-off-the-shelf (COTS) RPA tools indicates that all of them have capabilities to test for the above requirements. RPA tools enable script-less automation, configuration and deployment of frameworks. Thus, testing an RPA implementation also leverages the same capabilities of the RPA tools. RPA tools can be used for test data as well as regression testing. However, defining the right strategy is critical in order to ensure that the bot implementation is successful.

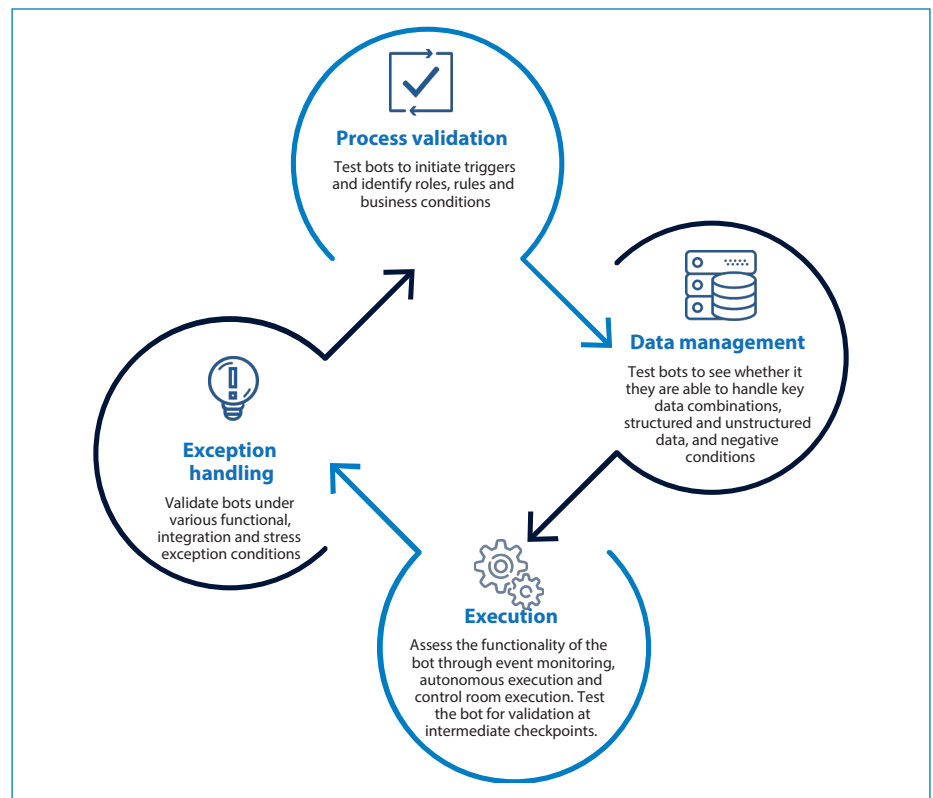


Fig 3: Key areas of Bot validation

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2. Can RPA be used to test non-RPA implementations?

Some of the key features of a good test automation tool include the ability to manage test data, easily maintain scripts, enable CI-CD integration, and support versioning, error handling and reporting.

How RPA Tools can address the traditional testing challenges

Let us examine how an RPA tool performs in each of these areas:

| Challenge Areas | Performance of RPA tools |
|--|---|
| Test data management | Data-driven testing is supported by many traditional tools. RPA can manage data from files like Excel/JSON/XML/DB and use these for testing |
| Testing in different environments | End-to-end business processes navigate through various environments like mainframe/web/DB/client server applications. RPA tools can easily integrate this process across multiple systems. Thus, RPA tools simplify business orchestration and end-to-end testing compared to other testing tools |
| Traceability | While RPA tools do not directly provide test script traceability, there are methods to enable this functionality. For instance, user stories/requirements stored in JIRA can be integrated with RPA automation scripts using Excel mappings to create a wrapper that triggers execution |
| Script versioning | A batch process can be implemented in the RPA tool to address this |
| CI-CD integration | This is available in most of the RPA tools |
| Reporting and defect logging | RPA tools have comprehensive dashboards that showcase defects that can be logged in Excel or JIRA through a suitable wrapper |
| Error handling | This feature is available in all RPA tools |

Benefits of using RPA tools for End-End Business Process testing

Compared to traditional automation tools, RPA products offer several advantages as listed below:

| Product features | Traditional automation tools | RPA tools |
|--|---|--|
| Coding knowledge | <ul style="list-style-type: none"> Coding knowledge is essential to develop automated scripts Programming knowledge and effort is needed to build the framework, generic reusable utilities and libraries | <ul style="list-style-type: none"> These tools offer codeless automation. Developing automated scripts requires some effort for configuration and workflow design. However, coding is minimal compared to traditional tools Generic reusable utilities are available as plug-and-play components |
| Maintenance | Extensive maintenance effort required | Minimal test maintenance effort required |
| Cognitive automation | No support for cognitive automation | RPA tools are popular for supporting cognitive automation by leveraging AI |
| Plugin support | Limited plugins are available for different technologies | Plugins are available for all leading technologies |
| Orchestration and load distribution | Load distribution during execution requires additional effort to develop the utilities and set up the infrastructure | This feature is available in most RPA tools. For example, feature of a popular RPA tool helps in load distribution during execution, without any additional effort aside from configuration. |
| Automation development productivity | Test development productivity is low since custom coding is required most of the time | Test development productivity is high as most generic activities are available as plug-and-play |
| OCR for text recognition | This feature is not available | This feature is available in all RPA tools |
| Advanced image recognition | This feature is not available. Either additional scripting or a third-party tool is needed to support this | This feature is available in all RPA tools |
| In-built screen and data scraping wizards | This feature is not available and requires integration with other tools | This feature is available in all RPA tools |

Additionally, RPA tools can be used effectively to accelerate test automation of applications hosted on Citrix/VM, flash applications, legacy apps, older Java versions, third-party applications like BMC Remedy, ServiceNow etc.

Here is a detailed feature comparison between a traditional automation tool and an RPA tool. (Reference Scale: 1-Low score and 5-High Score)

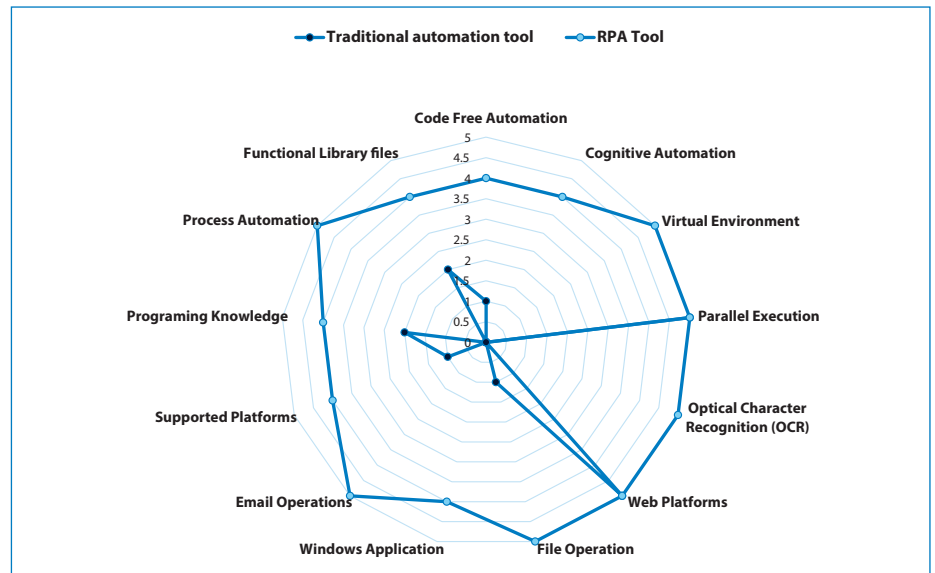


Fig 4: Feature comparison

Infosys expertise in RPA testing

Infosys delivers comprehensive automation testing frameworks for leading RPA tools, thereby addressing some of the critical challenges in RPA testing like test data management, exception handling and reporting, to name a few.

Our key RPA capabilities include:

Infosys RPA bot store

The store offers pre-engineered plug-and-play RPA bots that automate business processes and test suites. It also provides reusable components like DB login, test status reporting, DB to DB comparison, and test management (JIRA SAP login and file operations) to boost development productivity. Infosys BOT store helps clients to download these reusable BOTS and reduces the overall effort. There are reusable BOTS developed for specific package testing, upgrades of specific packages which results in overall reduction in test preparation effort.

Infosys has also placed several reusable BOTS which will work with specific market wide RPA tools within their marketplace. This helps the client with reduced test preparation effort.

BOT Validator framework

BOT Validation framework helps to automate RPA test cases for validating

BOTS and perform as per the instructions.

- Handle exceptions gracefully and has ability to perform at higher efficiency by performance measure
- Validate business flows and business exceptions and has ability to validate from heterogeneous systems
- Increase testing efficiency and reduce skilled resource requirement
- Eliminate manual testing and reduce automation engineering effort

Open source RPA automation utility

RPA automates processes across heterogeneous applications that could be web or Windows based. This Infosys tool is GUI-based and generates a single end-to-end test automation script by combining open source test automation tools.

Though RPA is an innovative technology and suitable for end-to-end process, it has few limitations with respect to handling application performance, security testing, data migration testing separately.

Below are some of the recommendations for using RPA in system testing scenarios:

- Customer has heterogeneous systems with complex data flows and a single solution is required to test the end-to-end functionality
- In cases where there is a need for attended and unattended process validation and customer has existing RPA infrastructure, RPA tool can be leveraged for testing purpose as well
- ROI of using RPA is significantly high as it has inherent advantages like script-less automation, built-in components for handling heterogeneous system interactions
- A major advantage with RPA tools is they come with procedures to validate digital system needs

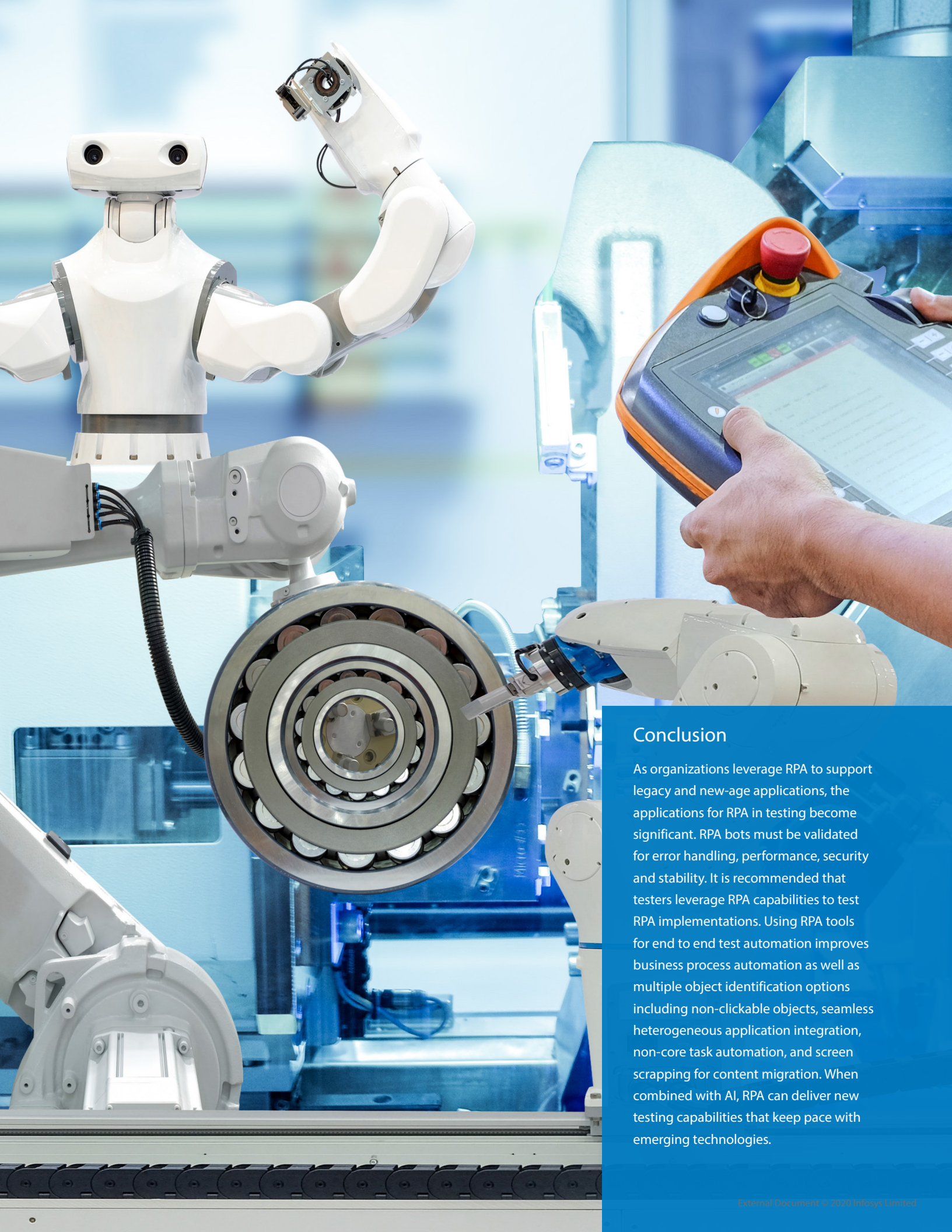
Hence based on these conditions if used strategically RPA has shown to reduce the testing cycle by 40%.



Case study

A leading financial services and insurance company based in the Europe region wanted a next-gen test automation framework supporting fast and codeless automation as part of their digital transformation journey. Infosys helped the company move from traditional test automation to RPA based test automation. We created a **one-touch test automation framework** and an **enterprise automation service** that supports business process automation of legacy mainframe, windows based and web based on-premises and cloud applications. Our solution helped the client increase test coverage by 25% and reduce the release cycle by 50%.





Conclusion

As organizations leverage RPA to support legacy and new-age applications, the applications for RPA in testing become significant. RPA bots must be validated for error handling, performance, security and stability. It is recommended that testers leverage RPA capabilities to test RPA implementations. Using RPA tools for end to end test automation improves business process automation as well as multiple object identification options including non-clickable objects, seamless heterogeneous application integration, non-core task automation, and screen scrapping for content migration. When combined with AI, RPA can deliver new testing capabilities that keep pace with emerging technologies.

About the Authors

Subhabrata Pal

Automation Architect, Infosys Validation Solutions

Srinivas Yeluripaty

AVP & Senior Principal, Infosys Validation Solutions

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For more information, contact askus@infosys.com



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