The Robotic Process Automation Handbook

A Guide to Implementing
RPA Systems

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About the Author

Tom Taulli has been developing software since the 1980s. In college, he started his first company, which focused on the development of e-learning systems. He created other companies as well, including Hypermart.net that was sold to InfoSpace in 1996. Along the way, Tom has written columns for online publications such as BusinessWeek.com, TechWeb.com, and Bloomberg.com. He also writes posts on artificial intelligence (AI) and RPA for Forbes.com and is an advisor to various companies in the space. You can reach Tom on Twitter (@ttaulli) or through his web site (Taulli.com) where he has online courses.

About the Technical Reviewer

John Hindle is a founding partner of Knowledge Capital Partners, a global consultancy offering research, executive education, and advisory services. With a 35-year career as senior executive and advisor in technology industries, he currently serves as vice-chair of the IEEE 2755 Working Group on Intelligent Process Automation. John holds a doctoral degree from Vanderbilt University and publishes extensively in business, trade, and academic media. His most recent book, with Leslie Willcocks and Mary Lacity, is *Becoming Strategic with Robotic Process Automation*.

Foreword

Robotic process automation, or RPA, is the fastest-growing enterprise software segment in history. Much like his last book in this series, *Artificial Intelligence Basics*, Tom Taulli has managed to capture the essence of a highly complex and fast-changing market in thirteen brief chapters. Anyone getting started with RPA would be well served to start here.

RPA's arrival could not have been better timed. RPA products went mainstream just as the world's economy was booming, employers faced the tightest job market in memory, and rising labor costs made business process outsourcing no longer an attractive solution. This confluence of forces set the stage for a tech breakout, the likes of which we haven't seen since Netscape.

The RPA value proposition is seductively simple – a tireless army of software robots (bots) that will work night and day to tackle the mountain of labor-intensive data entry work that sustains our digital world. And RPA should be fast to implement – no more waiting months for expensive APIs to be developed for legacy integration since bots interface with your systems by logging in just like humans do. Watch a bot cut and paste a few hundred fields for you in a split second, and it's hard not to get a little excited.

In three short years, the current leading vendors in the stand-alone RPA market, UiPath, Automation Anywhere, and Blue Prism, have defied all the cynics and grown from small start-ups to multibillion dollar valuations, thousands of employees and corporate clients, and they continue to post triple-digit revenue growth. They have also left behind mixed business results, layoffs, and questions about what use cases are actually best suited to RPA and which are better served with other low-code automation technologies.

To cut through the hype, Tom has interviewed leaders and expert practitioners from across the RPA space and brought together their collective wisdom and real-world experience in this single volume. The result is a practical guide to successfully deploying RPA in your business. As a technology partner to many of the pure-play RPA vendors covered in this book, I found Tom's treatment of the market useful and objective.

In these pages, you will progress rapidly from selecting the right use case for RPA vs. other automation methods to scaling your RPA program. You'll learn how RPA integrates with technologies like AI and low-code automation to provide complete solutions. You'll also read examples of how companies are establishing new organizational models to govern and manage a successful, enterprise-scale robotic workforce.

As with any revolutionary new technology, starting with RPA has proven relatively simple but scaling RPA projects is proving more challenging. The result is enterprise deployment timelines sometimes extend to twenty-four months and higher than normal failure rates reported by industry analysts. Experienced leadership and best practices are hard to come by because the market and its participants are so new and immature, and the demand for their expertise is explosive.

Exaggerated expectations and marketing hype make up a substantial portion of the problem Tom's book addresses. RPA is "robotic" automation, but these aren't robots; they can't sense and respond to change anything as humans do. In the right applications and hands, RPA is a powerful tool to augment a human workforce, transform the customer experience, and accelerate digital transformation. RPA programs require planning and governance to ensure they continue to deliver the results you expect.

Where does the RPA market go from here? We can see the future in how the largest adopters of RPA are increasingly viewing it as part of an overall automation program that includes human workflow, API integration, and AI in a unified platform. Digital transformation is only truly enabled when organizations break down the process and data silos to

orchestrate work among digital workers, humans, and algorithms. RPA is also moving off the desktop into the cloud for better security, governance, efficiency, and scalability – top CIO priorities.

Customer demand for full-stack automation can be seen in both the addition of basic human workflow capabilities and cloud options being introduced by RPA vendors. It is also happening by acquisitions – like PEGA's purchase of attended automation specialist OpenSpan, covered in this book, and in Appian's recently announced acquisition of Jidoka RPA, the top-ranked Gartner Peer Insights RPA product. While too recent to be included in this book, Appian's addition of RPA to its existing Robotic Workforce Manager epitomizes the convergence we are witnessing between the RPA and low-code automation markets as well as the migration of RPA from the desktop to the cloud.

This is an exciting time to dive into the RPA market. This book will help you chart a path to success with RPA and avoid the pitfalls that have tripped up others on their automation journey.

Michael Beckley
Founder and Chief Technology Officer, Appian

Introduction

In Silicon Valley today, one of the buzziest categories is RPA, or robotic process automation, as venture capitalists have been investing huge sums in the category. The reason is simple: the software providers have been ramping at a staggering rate.

In fact, according to a recent survey from LinkedIn, RPA is the second fastest growing career category, up 40% in 2019. The report notes: "Careers in Robotics Engineering can vary greatly between software and hardware roles, and our data shows engineers working on both virtual and physical bots are on the rise."[1]

But as with any rapidly growing industry – especially in the technology sector – there is lots of misinformation and hype. It's inevitable.

Yet this can make it difficult for companies to evaluate the technology. What are the best solutions? What are the success factors for implementation? What are the gotchas?

Well, in this book, we'll help to answer these questions – and many more. Yes, it is your handbook for navigating the noise in the RPA marketplace.

There are certainly many factors that help explain the surge in RPA. But perhaps the most important is the need for digital transformation. Simply put, companies do not want to be flat-footed when a disruptive start-up upends an industry, as seen with Uber.

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[1]https://business.linkedin.com/content/dam/me/business/en-us/talent-solutions/emerging-jobs-report/Emerging_Jobs_Report_U.S._FINAL.pdf

INTRODUCTION

As former Cisco CEO John Chambers has written in his book *Connecting the Dots*: "But I also now understand the fears because this disruption will be so brutal that 40-plus percent of businesses today won't be here 10 years from now."

However, if companies take the initiative to craft the right strategies and carry them out, the future can be bright, even for those that are in traditional industries. If anything, they have certain advantages that can be leveraged: trusted brands, extensive distribution and customer bases, and talented employees.

No doubt, automation will be critical. "The disparity between automated and non-automated companies will grow," said Prince Kohli, who is the CTO of Automation Anywhere. "Research has shown more than half of businesses in North America have already implemented some type of automation solution – meaning that we have now reached the tipping point of adoption for this transformative technology. Given the dramatic increases in productivity, reductions in cost and improvements to employee satisfaction that RPA provides, we'll soon see the gap widen between early adopters and holdouts – in terms of revenue, customers, talent acquisition and retention – making it much harder for the latter to compete."[2]

OK then, so what will we cover in this book? Let's take a look at a quick outline:

Chapter 1 – RPA Foundations: This is a high-level overview of the RPA industry, with coverage of assisted/unassisted automation, the history of the technology, the benefits and drawbacks, and comparisons to other automation technologies.

Chapter 2 – RPA Skills: This chapter takes a look at core technologies like on-premise software, cloud computing, OCR (optical character recognition), databases, APIs (application programming interfaces), and AI. There are also explanations of programming techniques, such as Agile and DevOps. Finally, there is a tutorial on flowcharts, which are crucial for RPA.

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[2]From the author's interview with Prince Kohli, the CTO of Automation Anywhere.

Chapter 3 – Process Methodologies: Before implementing RPA, a company may want to ensure that its processes are in good shape. This can be done by using methodologies like lean, Six Sigma, and lean Six Sigma.

Chapter 4 – Planning: This chapter provides help on assessing processes, determining what to automate, and how to measure ROI. We also show how to hire an RPA consultant.

Chapter 5 – RPA Vendor Evaluation: Here you will find the steps in selecting the right RPA software, such as looking at costs, training, functionality, and security.

Chapter 6 – Center of Excellence (CoE): This is a group that helps manage an RPA implementation. So in this chapter, we'll show how to assemble one and how to best utilize it. We also take a look at the main roles for RPA (business analysts, developers, managers, etc.).

Chapter 7 – Bot Development: You'll get a fundamental understanding of how to create a bot, such as developing the structure, using variables, structuring workflows, and debugging. The chapter focuses on the UiPath software system.

Chapter 8 – Deployment and Monitoring: Here you will see how to put bots into production and make sure they are functioning properly. Some best practices on scaling are also explained.

Chapter 9 – Data Preparation: RPA can be a great way to transition to AI. But to do this, there needs to be a strong data strategy. This chapter shows a technique for this, called the CRISP-DM Process.

Chapter 10 – RPA Vendors: This is a review of not only the large RPA software developers, like UiPath, Automation Anywhere, and Blue Prism, but also the smaller ones.

Chapter 11 – Open Source RPA: This category of RPA is small but it is poised for growth. This chapter will highlight some of the more notable open source projects.

Chapter 12 – Process Mining: What started as an academic area of research has recently turned into a large industry. The technology helps to map and optimize processes – and has become increasingly important to RPA.

Chapter 13 – Future of RPA: Here we look at some of the major trends in the industry, like the changing of the business model, the growth of cloud systems, and the importance of AI.

At the back of the book, you'll also find an appendix of resources for further study, a glossary of common RPA terms, and a list of RPA consultants.

Accompanying Material

Any updates will be provided on my site at `www.Taulli.com`.

CHAPTER 1

RPA Foundations

What the Technology Can Do

RPA (robotic process automation) has become one of the hottest categories for venture capital investment. In November 2018, Automation Anywhere announced that the Softbank Vision Fund invested $300 million in the start-up.[1] But it was not the only amount. The Series A round was actually over $500 million and included strategic investors like Workday, which is a top cloud-based ERP (enterprise resource planning) operator. The managing director and cohead of the Workday Ventures arm noted: "RPA is becoming a bigger focus for our customers, which is why it's important for us to partner closely with Automation Anywhere, a market leader."[2]

Then there was another mega round for a fast-growing RPA vendor. In April 2019, UiPath announced it raised $568 million for its Series B round, with tier-one investors like Coatue, Wellington, CapitalG, Accel, and Sequoia.

In only about two years, UiPath had seen an explosion in growth:

- The valuation went from $110 million to $7 billion.

- The annual recurring revenues surged from $8 million to $200 million.

- The employee base jumped by 16X to 2,500.

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[1] www.automationanywhere.com/uk/press-room-uk/automation-anywhere-announces-%24300-million-investment-from-the-softbank-vision-fund

[2] www.prnewswire.com/news-releases/automation-anywhere-announces-strategic-investment-from-workday-ventures-300791701.html

- • There was also the launch of six new releases of the UiPath Enterprise RPA platform.

- • The company snagged many large customers like McDonald's, Duracell, Google, Nippon Life Insurance, Ricoh, and Voya Financial.

The CEO and cofounder of UiPath, Daniel Dines, said: "We are at the tipping point. Business leaders everywhere are augmenting their workforces with software robots, rapidly accelerating the digital transformation of their entire business and freeing employees to spend time on more impactful work. UiPath is leading this workforce revolution, driven by our core determination to democratize RPA and deliver on our vision of a robot helping every person. I am humbled by the amazing support our customers, partners and investors give us every day, inspiring us to work harder to evolve RPA as the platform that not only unlocks the true potential of AI, but also other emerging technologies. We are just getting started."[3]

Yes, it's exciting times for the RPA industry and there are few signs of a slowdown, at least in terms of customer demand. So then why all the interest? What are some of the key drivers for RPA? And besides, what really is RPA?

In this chapter, we'll answer these questions as well as get a foundation on the core elements of the technology.

What Is RPA?

RPA can be a slippery term. A main reason for this is that it was coined in 2012, when the category was still evolving. At the time, the chief evangelist for Blue Prism, Pat Geary, came up with the term RPA.

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[3] www.uipath.com/newsroom/uipath-raises-568-million-series-d-funding-round

But when you look at each word, it's understandable why RPA can be a bit confusing. For example, the word "robotic" does not refer to a physical robot – instead, it is about a software-based robot (or bot) that can automate human actions in the workplace (generally for white collar applications in clerical and administrative functions). A bot can be delivered via the cloud or through downloadable software. However, the use of robotic does look like a savvy marketing move (hey, aren't robots pretty cool?).

Even the word "process" is not particularly descriptive either. A better alternative would be "tasks," which are individual action items that are a part of a process.

OK, then what really is RPA? Well, in a nutshell, RPA involves bots that perform a set of specified actions or tasks, such as the following:

- The cut-and-paste of information from one app to another

- The opening of a web site and login

- The opening of an e-mail and attachments

- The read/write of a database

- The extraction of content from forms or documents

- The use of calculations and workflows

Such things may sound kind of mundane, boring, and simplistic. But that's the point. RPA is focused on those tasks that are really a waste of efforts for workers. Shouldn't they be doing more important activities?

I think so.

Now, interestingly enough, the use of the word "automation" in RPA is actually spot-on. It's really at the core of RPA functionality.

To get a better sense of all this, I think it's a good idea to look at how various RPA software companies view the concept. Here's a look:

UiPath: "Robotic Process Automation is the technology that allows anyone today to configure computer software, or a 'robot' to emulate

and integrate the actions of a human interacting within digital systems to execute a business process. RPA robots utilize the user interface to capture data and manipulate applications just like humans do. They interpret, trigger responses and communicate with other systems in order to perform on a vast variety of repetitive tasks. Only substantially better: an RPA software robot never sleeps, makes zero mistakes and costs a lot less than an employee."[4]

Automation Anywhere: "RPA is really as simple – and powerful – as it sounds. Robotic Process Automation enables you with tools to create your own software robots to automate any business process. Your 'bots' are configurable software set up to perform the tasks you assign and control.

"Think of them as your Digital Workforce. Show your bots what to do, then let them do the work. They can interact with any system or application the same way you do. Bots can learn. They can also be cloned. See how they are working and adjust and scale as you see fit. It's code-free, non-disruptive, non-invasive, and easy."[5]

PEGA: "Robotic process automation (RPA) can be a fast, low-risk starting point for automating processes that rely on outdated legacy systems. Bots can pull data from manual systems without APIs into digital processes, ensuring faster and more efficient outcomes.

"Now, let's be honest about what RPA doesn't do. It doesn't transform your organization all by itself, and it's not a fix for enterprise-wide broken processes and systems. For that, you'll need end-to-end intelligent automation."[6]

Kryon Systems: "Robotic Process Automation enables enterprises to create true virtual workforces that drive business agility and efficiency. A virtual workforce, comprised of software robots that can execute business tasks on enterprise applications, becomes an integral part of an

[4] www.uipath.com/rpa/robotic-process-automation

[5] www.automationanywhere.com/robotic-process-automation

[6] www.pega.com/rpa

enterprise's greater workforce. It is managed just as any other team in the organization and can interact with people just as other employees would interact with one another. Virtual workers (robots) complete business processes, just as a person would, but in less time, with greater accuracy and at a fraction of the cost. RPA stands out for its ability to impact business outcomes, resulting in significant ROI."[7]

These all provide a fairly good view of RPA, showing the broad applications and benefits. These definitions also highlight that the vendors in the industry have their unique twists and approaches on the technology (in this book, we'll take a deeper look at the different solutions). In some cases, the differences can be quite stark.

But boiling things down, I think the best way to think of RPA is to use the visual for Automation Anywhere: a digital worker. It's about how automation technologies – like screen scraping and workflows – can essentially copy what employees do on a daily basis.

Note   Keep in mind that it's not uncommon for companies to name their bots!

But what is the difference with RPA vs. other forms of automation? Isn't the technology just like an Excel macro?

Not really. First of all, a macro is only for a particular application. But with RPA, the system can be used for just about anything, whether on a PC or even a mainframe. Next, RPA can record a person's actions to help create the automation. Some systems will even use sophisticated technologies like AI (Artificial Intelligence) to help with this. Finally, an RPA platform will become a valuable repository of knowledge about how work is done in an organization. This can provide insights on how to improve workflows and processes, which could drive even further efficiency.

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[7]www.kryonsystems.com/what-is-rpa/

Flavors of RPA

There are different types of RPA approaches. Part of this is due to the fact that the technology is continuing to evolve. Vendors are also looking at ways to redefine RPA so as to help them stand out in the marketplace.

On a high level, you can divide the flavors into the following:

- Attended RPA (which may be referred to as robotic desktop automation or RDA): This was the first form of RPA that emerged, back in 2003 or so. Attended RPA means that the software provides collaboration with a person for certain tasks. A prime example would be in the call center, where a rep can have the RPA system handle looking up information while he or she talks to a customer.

- Unattended RPA: This technology was the second generation of RPA. With unattended RPA, you can automate a process without the need for human involvement – that is, the bot is triggered when certain events happen, such as when a customer e-mails an invoice. Consider that unattended RPA is generally for back-office functions.

- Intelligent process automation or IPA (this may also be referred to as cognitive RPA): This is the latest generation of RPA technology, which leverages AI to allow the system to learn over time (an example would be the interpretation of documents, such as invoices). Because of this, there may be even less human intervention since the RPA software will use its own insights and judgements to make decisions.

It's important to understand these variations because some RPA systems may specialize in a particular approach. Besides, when looking at your own needs for automation, it's a good idea to see what types may work the best.

History of RPA

No doubt, the concept of automation is far from new. Did you know that the first mention of the concept was from Homer's *The Iliad*? In the poem, he described how Hephaestus (the Greek god of blacksmiths) used automatons (or machines) to build weapons for the gods of Mount Olympus.

Yet it would not be centuries later until notable real-world examples of automation would emerge. After all, it's only been during the past 70 or so years that computers have been a major catalyst for this trend.

Along the way, there have been different periods of automation, based on the types of technologies available. They would also provide a foundation for RPA platforms.

- Mainframe Era: These were huge machines developed by companies like IBM. They were expensive and mostly available to large companies (although, innovators like Ross Perot would create outsourcing services to provide affordable options). Yet they were incredibly useful in helping manage core functions for companies, such as payroll and customer accounts.

- PC Revolution: Intel's development of the microprocessor and Microsoft's development of its operating system revolutionized the technology industry. As a result, just about any business could automate processes, say by using word processors and spreadsheets.

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But the automation technologies – while powerful – still had their drawbacks. They could easily result in complex IT environments, which required expensive and time-consuming integrations and custom coding. Because of this, an employee may have to use multiple applications in their daily activities that could involve wasteful tasks like moving data from one to the other. The irony was that the technology could make employees less productive!

From this emerged the key elements for RPA, which came about in the early 2000s. A big part of this was screen scraping, which is the automation of moving data among applications, which turned out to provide a nice boost to efficiency and effectiveness.

But the nascent RPA market got scant attention. It was mostly perceived as low-tech and a commodity. Instead, investors and entrepreneurs in Silicon Valley focused their attention on the rapidly growing cloud market that was disrupting traditional IT systems.

But around 2012 or so, the RPA market hit an inflection point. There was a convergence of trends that made this happen, such as the following:

- In the aftermath of the financial crisis, companies were looking for ways to lower their costs. Simply put, traditional technologies like ERP were reaching maturation. So companies needed to look for new drivers.

- Companies also realized they had to find ways to not be disrupted from technology companies. RPA was considered an easier and more cost-effective way to go digital.

- Some industries like banking were becoming more subject to regulation. In other words, there was a compelling need to find ways to lessen the paperwork and improve audit, security, and control.

- RPA technology was starting to get more sophisticated and easier to use, allowing for higher ROI (return on investment).

- Large companies were starting to use RPA for mission-critical applications.

- Demographics were also key. As the millennials started to enter the workforce, they wanted more engaging work. They wanted careers, not jobs.

"The evolution of the RPA market is like any major technology trend," said Mihir Shukla, who is the CEO and cofounder of Automation Anywhere. "There was a gradual progress, which involved periodic breakthroughs. A prime example is the iPhone. Before this, there was a long period of incremental innovation."[8]

Fast forward to today, RPA is the fastest growing part of the software industry. According to Gartner, the spending on this technology jumped by 63% to $850 million in 2018 and is forecasted to reach $1.3 billion by 2019.[9]

Or consider the findings from Transparency Market Research. The firm projects that the global market for RPA will soar to $5 billion by 2020.[10]

Here are some other metrics to note:

- By 2020, RPA along with AI will reduce the business shared-service centers by 65% (Gartner). There will also be adoption by 40% of large enterprises, compared to 10% in 2019.[11]

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[8]From the author's interview with Automation Anywhere CEO Mihir Shukla (on October 9, 2019).

[9]www.idgconnect.com/analysis-review/1502790/robotic-process-automation-trend-enterprise-digitalisation

[10]www.cio.com/article/3124638/why-bots-are-poised-to-disrupt-the-enterprise.html#tk.cio_rs

[11]www.cio.com/article/3236451/what-is-rpa-robotic-process-automation-explained.html

- • Based on current projections, there will likely be saturation in the RPA market by 2023 (Deloitte).[12]

- • The financial impact from RPA could hit $6.7 trillion by 2025 (McKinsey & Company).[13]

- • In terms of the global market share for RPA software, North America represents 51% and Western Europe is at 23%. But Asia is starting to get traction, especially Japan.[14]

- • By 2023, the forecast is that there will be $12 billion in spending on RPA services (Forrester).[15]

The Benefits of RPA

When it comes to RPA, the most talked about benefit is the ROI. Compared to just about any other enterprise software technology, the metrics are standout. Take the Computer Economics Technology Trends 2019 report, which is a survey of 250 companies (the study covered many industries that had revenues from $20 million to billions). Among them, about 12% implemented RPA within their organizations and half of them said there was a positive ROI within 18 months (the remaining was mostly at breakeven).[16] "We expect RPA to grow rapidly, because of the

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[12]www2.deloitte.com/ro/en/pages/technology-media-and-telecommunications/articles/deloitte-global-rpa-survey.html

[13]https://globalpayrollassociation.com/blogs/technology/what-the-history-of-rpa-technology-says-about-its-future

[14]www.gartner.com/en/newsroom/press-releases/2019-06-24-gartner-says-worldwide-robotic-process-automation-sof

[15]www.forrester.com/report/The+RPA+Services+Market+Will+Grow+To+Reach+12+Billion+By+2023/-/E-RES156255#

[16]www.wsj.com/articles/unleash-the-bots-firms-report-positive-returns-with-rpa-11551913920