UNIVERSITY OF PITEŞTI

FACULTY OF SCIENCE,

PHYSICAL EDUCATION AND INFORMATICS

MASTER STUDIES

MASTER THESIS

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Automation Testing with RPA in Industrial Environments

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# **INTRODUCTION**

The chosen subject for my dissertation work is “Automation Testing with RPA in

Industrial Environments”.

In the business world, there is always scope for improvement. Enterprises are constantly looking for ways to improve performance levels and gain an edge over the competition. In the digital age, automation is available everywhere. Many businesses worldwide are adopting process automation as a key strategy to stay ahead in the run.

There are a lot of reasons test automation is beneficial, and by adhering to automated testing best practices you can ensure that your testing strategy delivers the maximum return on investment (ROI). Automated testing will shorten development cycles, avoid cumbersome repetitive tasks and help improve software quality.

Thorough testing is crucial to the success of a software product. Automated testing, in which Quality Assurance teams use software tools to run detailed, repetitive, and data-intensive tests automatically, helps teams improve software quality and make the most of their always-limited testing resources.

Test automation tools like UiPath help teams test faster, allows them to test substantially more code, improves test accuracy, and frees up QA engineers so they can focus on tests that require manual attention and their unique human skills.

Selecting an automated testing tool is essential for test automation. There are a lot of automated testing tools on the market, and it is important to choose the automated testing tool that best suits your overall requirements.

[The](https://searchcio.techtarget.com/Ultimate-guide-to-RPA-robotic-process-automation) RPA is growing in popularity because it can reduce costs, streamline processing and drive better customer experiences. Another attraction of RPA software is that business units can implement it without their having to learn new tools or ask IT teams for support -- and without changing an organization's underlying IT infrastructure.

As RPA has grown in popularity, however, enterprises are seeing the need to integrate RPA process automations in their IT systems, especially in Software Testing.

Chapters from the dissertation paper are about the theoretical context of the concept and development of the RPA testing application (Chapter 1), about the development environ-ment (Chapter 2), also about the implementation of the Automatic Testing program (Chapter 3).

Title of the first chapter is: “Tehnologies used”, in which there are described and explained RPA (Robotic Process Automation) notions .

Second chapter is called “Development Tools” and refers to the development environment in which the application was created (UiPath Studio).

Third chapter, “Automation testing with UiPath Studio”, refers to the design, implementation and functionalities for the RPA application, also testing the application, conclusions and future improvements.

# **CHAPTER 1. Tehnologies used**

## What is RPA?

Digital transformation is directly influenced by the people adopting it, not technology. New skills, new roles, a culture of openness to change, and permanent external exploration make digital transformation more than a strategic and technological project. Digital transformation can be anything from IT infrastructure modernization to optimization or new digital business models.

Digital transformation is widely used in the public sector to describe initiatives such as putting services online or legacy modernization. RPA can accelerate these processes (for example, by moving data from scanned documents into digital applications, freeing the human in charge of this task to perform more high-value activities).

RPA is a type of software that mimics the activity of a human being in carrying out a task within a process. It can do repetitive stuff more quickly, accurately, and tirelessly than humans, freeing them to do other tasks requiring human strengths such as emotional intelligence, reasoning, judgment, and interaction with the customer. It can automate repetitive, manual and rule-based processes, with low exception rates and standard electronic readable input. Is non-invasive, scalable and can work in any industry. RPA reduces costs rapidly and increases ROI[[1]](#footnote-1). When combined with AI and machine learning, it can capture more context from the content it is working with by reading text or handwriting with optical character recognition (OCR), extracting entities like names, invoice terms or addresses using natural language processing (NLP), and capturing more context from images, such as automatically estimating accident damage in an insurance claim picture.

Today, multiple technologies revolve around RPA to enhance automation results. The reason why is growing in popularity is that it can reduce costs, streamline processing and drive better customer experiences. Another attraction of RPA software is that business units can implement it without their having to learn new tools or ask IT teams for support -- and without changing an organization's underlying IT infrastructure.

Newer RPA tools use AI, machine vision and natural language processing to mitigate breakage problems. Modern RPA platforms also provide some integration with centralized IT governance and management capabilities, making it easier to scale the use of RPA across the enterprise.

## How does RPA work?

RPA robots can handle tasks just as humans do. Only much faster and with more accuracy. It mirrors the way people are accustomed to interacting with and thinking about software applications. RPA's ability to copy the way humans perform a computer-based process has contributed to its popularity compared with automation tools such as application programming interfaces (APIs) or low-code development that are more scalable but less intuitive or require expert knowledge to use.

RPA alone can process solely structured digital documents. Together with AI and ML models, it can process, for example, scanned invoices—which are unstructured, digitally converted documents. RPA interacts with an application through the User Interface. With Native Integrations, automation development is much simpler for commonly used applications like SAP or Salesforce.

Advanced analytics help you measure automation performance against business KPIs (like time or money saved).

Long-running workflows enable you to orchestrate complex automated processes. It facilitates synchronous and asynchronous interactions between human users and robots for maximum effectiveness and resource allocation.

The simplest RPA bots can be created by recording the clicks and keystrokes as a user interacts with an app. When problems emerge, a user can simply watch how the bot is connecting with the app and identify the steps that need to be fine-tuned.

In practice, these basic recordings often serve as a template for building more robust bots that can adapt to changes in screen size, layout or workflows. More sophisticated RPA tools use machine vision to interpret the icons and layout on the screen and make adjustments accordingly.

Some RPA tools are also able to use these initial recordings to create hybrid RPA bots that start by simply recording an existing workflow and then dynamically generating a workflow automation on the back end. These kinds of hybrid bots take advantage of the simplicity of RPA development and the scalability of native workflow automation.

In other RPA implementations, process mining and task mining tools are used to automatically capture business process workflows that serve as starting templates for RPA automations. The process mining can analyze the logs of ERP and CRM applications, for example, to automatically generate a map of common enterprise processes. Task mining tools use a locally running app with machine vision to capture a user's interactions across multiple apps. All the major RPA vendors are starting to develop these kinds of process mining integrations. Process Mining and Task Mining allow you to scientifically discover automation use cases in the organization by analyzing back-end and front-end data.

RPA tools can also be connected to AI modules that have capabilities like OCR, machine vision, natural langue understanding or decision engines, resulting in what is called intelligent process automation. These capabilities are sometimes packaged into cognitive automation modules designed to support best practices for a particular industry or business process.

With the collaboration between an human and a software robot, the tasks can be performed much faster and with more accuracy. All the rule-based and repetitive actions could be moved from the human to the robot. The RPA robot performs the necessary logins and all the background searches, for example.

## The evolution of RPA

RPA is built on the success of macro technologies developed for automating manual tasks within applications like Excel. In the 1980s, these capabilities were extended to many enterprise applications using highly customized data-scraping applications. A number of testing tool vendors beefed up their automation capabilities at the turn of the century to help automate user interaction testing and load testing.

The actual term RPA was coined in 2012 by Phil Fersht, founder and lead analyst at HFS Research. The technology plodded along until about 2018 when it exploded in popularity as companies undertook digital transformation and RPA platform capabilities improved. Today it is one of the fastest growing categories of enterprise application automation.

Today, RPA software is particularly useful for organizations that have many different and complicated systems that need to interact together fluidly. For instance, if an electronic form from a human resource system is missing a zip code, traditional automation software would flag the form as having an exception and an employee would handle the exception by looking up the correct zip code and entering it on the form. Once the form is complete, the employee might send it on to payroll so the information can be entered into the organization's payroll system.

With RPA technology, however, software has the ability to adapt to interact with the payroll system without human assistance.

## What are the benefits of RPA?

***1) More Accurate Data Entry***

RPA data entry is more accurate than manual data entry. Software bots aren’t prone to human error and they don’t get tired or distracted. There are no typos and no entries going in the wrong field. The exact degree of accuracy depends on the optical character recognition (OCR) that the bot software uses.

***2) No Down-Time***

Software bots can work all the time – 24-hours a day every single day of the year – at 100% capacity. RPA doesn’t take holidays, doesn’t sleep, won’t need sick days, and never has an “emotionally unproductive” day. It’s perfectly understandable that human employees need those things. Bots help make sure there’s time for them to enjoy their vacations, get enough sleep, and take care of their health rather than scrambling and working overtime to keep up with data entry.

***3) Increased Productivity***

The fact that RPA can do round-the-clock data entry without pausing to fix errors means it gets more work done than a human doing the same job could. Typically, a data entry bot can do the work of 4 to 8 regular employees. And if you had in-house employees who were handling the data entry before you started using bots, they now get the chance to focus their energy on more productive tasks. Plus, having the data entered automatically in an easily searched format makes it easier for employees to use the information, which increases their productivity as well.

***4) Fast Implementation***

Getting data entry bots up and running goes quickly. Implementing a new RPA software system certainly happens much faster than training a new person. You can have data entry software bots up and running in just days. In contrast, if you wanted to hire a new human employee you’d be taking time to sort through resumes, conduct interviews, go through the hiring process, and then train them once you finally find someone.

***5) Easy To Scale***

If you ever get too much work for your robotics process automation to handle there’s a simple solution. Just add extra bots. That’s much easier than hiring and training new employees for data entry tasks. RPA creates a system that’s very easy to scale with your growing business. You just contact your software provider, let them know what you need, and they’ll get it set up.

***6) No Training Time***

If your process changes and the bots need to learn something new, you can either replace them with new bots or alter their programming. That goes much faster than training employees in new tasks. And that’s also going to save you the money it would cost for existing employees to take time away from other tasks to train new hires.

***7) They’ll Never Quit***

With RPA, you don’t have to worry about employees quitting or dealing with turnover. Bots don’t care how hard they’re working, whether or not they’re happy in their jobs, or how many repetitive tasks they get stuck with. They never retire or decide it’s time to move on to a different job. In short, bots mean you’ll never have to worry about hiring and training new employees for data entry again.

***8) Repatriate Jobs***

People are often concerned about robotic process automation taking jobs away from real people. But a lot of companies who need manual data entry already aren’t hiring local employees for those tasks. They’re outsourcing their data entry overseas. Since the bots would be managed/hosted here in the USA, using RPA actually repatriates jobs.

***9) Tighter Security***

When human employees are entering data there’s always a certain amount of risk. No one likes to think their employees would betray them, but the simple fact is that most fraud happens internally. And even when you can trust your employees, having them enter sensitive data can still be a privacy concern. Bots don’t understand the significance or meaning of the data they’re working with, which protects the privacy of your vendors and clients. Plus, bots don’t have to save/memorize passwords like a human so there’s less risk of password breach.

***10) Minimal IT Resources***

Maintaining software bots requires minimal IT resources. In some cases, IT doesn’t need to get involved at all. Your RPA systems will be managed by the software provider. They’re responsible for maintenance, updates, etc. That takes the burden off IT (which probably already has more work than they can handle) and saves your company money.

## Applications of RPA

RPA can be used for real, quantifiable benefits in a lot of industry branches like: Data Analytics, Manufacturing, Telecommunication, Professional Services, Banking, Education, Healthcare, Public Sector, Insurance, Non-Profit/NGO and so on.

***Nielsen*** is an American company focusing on data, information and measurement for fast-moving consumer goods, consumer behavior and media. Is an S&P 500 company, it operates in over 100 countries and has over 50.000 employees. With the deployment of UiPath robots the company has managed to help automate many of its back-office functions in Finance, IT and Customer Support. Nielsen has also developed a hybrid Center of Excellence that is made up by 12 core members and an additional 150 champions from business units across the organization. This has allowed Nielsen to expedite automation efforts that will help accelerate its path to digital transformation. After this improvement, over 365.000 hours of manual work were automated, 179 projects were delivered and over 30 functions were engaged across over 40 countries.

***Schneider Electric*** is a European multinational company providing energy and automation digital solutions for homes, buildings, data centers and infrastructure, by combining technologies, real-time automation, software and services. Wanting to process, translate, print and scan specifications and technical documentation for its products and services and to better respond to the ever changing business context, the company employed UiPath robots, easily set up for taking over the document preparation process and the order processing for new supply chains, bringing important benefits like: 2 days and ½ for developing the project for processing documentation with UiPath and a reduction of the time for order processing with 99%.

***Orange Spain***, part of the Orange Group (the largest worldwide telecommunication companies) is once of the biggest mobile network operators in Spain, with over 11 million clients. In 2016 the company started a huge transformation to become digital, yet at the same time focused on the needs of the customers. It was decided from the beginning they wanted to use RPA so they set up the Orange Robot Factory, wanting to create at least one robot per week. The results were immediately visible, with 17 processes automates in the first 3 months and 2 million interactions done by robots in the first 6 months. At the end there were over 400 robots created and deployed, 250 employees trained in RPA on UiPath Academy and saving over 34 millions EUR in a little more than 2 years.

***Deloitte*** is one of the Big Four accounting companies and one of the largest professional services networks in the world. It provides audit, financial advisory, risk advisory, consulting, tax and legal services through a number of 312.000 professionals globally. Wanting to automate all the repetitive and manual tasks that take away precious time which could be used for customer engagements, Deloitte started its RPA journey with high impact processes like billing and onboarding. As the results from using automation started to appear, employees were encouraged to develop their own automations through a citizen developer program. Among the benefits it can be enumerated: 2200 employees were trained in UiPath and RPA and over 50 automation opportunities were identified immediately after launch.

***The New York Foundling*** is one of the New York City’s largest and oldest child welfare agencies. Its services include foster care, adoptions, mental health services, educational programs and many other community-based services. A large portion of the activities carried out by the clinicians of the New York Foundling involved filling in and archiving paper documents, as well as navigating and inputting data between five different systems. The data entry process was automated with the help of RPA, resulting in 4 hours per week saved for each of the clinicians and over 100.000 hours saved annually in total for the staff of the agency.

***Heritage Bank*** is Australia’s largest mutual bank, established in 1875 and providing all retail products, including home loans. The bank aimed to become “a digital bank with physical presence”, to build scalability and efficiency across the entire customer experience chain, from back office to front office. For this purpose, the bank chose UiPath and set up a dedicated Center of Excellence, supported by business champions in all departments. It managed to automated processes across the entire organization, getting to the point where every employee was interacting in one way or another with robots and started to make use of AI and Machine Learning in cognitive processes, such as Financial Crime Reporting or Living Expense Report Compiling. The end results were fascinating: 80 automated processes with a level of accuracy of 98% and 500 hours saved on loan application verification process.

***The University of Auckland*** is New Zealand’s leading university, with more than 40.000 students supported by 5.500 staff members. When they decided to implement RPA, they started with a full redesign of the processes chosen for automation, both in terms of how the activities were performed and the associated business rules. Then UiPath robots were deployed to take over some of the most significant and time-consuming processes - the student transcript process and the supply setup process. The success of this initiative opened the path to setting up an internal Center of Excellence to drive the RPA journey. But even more importantly, it convinced the University of Auckland to add RPA to their technical curricula through UiPath's Academic Alliance program. They managed to save 23.000 hours annually through automation with a success rate of 99% for all processed requests for automated processes in Finance and 70% turnaround time reduction for the supplier setup process.

***Max Healthcare*** is one of the largest healthcare services providers in India. It has a network of 12 hospitals and 5 medical facilities, as well as more than 2,300 doctors offering treatment across 29 specialties. Max Healthcare had a high number of daily activities that involved large volumes of patient information performed entirely manually. This posed many challenges: the long time needed and the high error rate, the archiving and retrieval of information, the security of documents and the sudden spikes in frequency and volumes of data. The RPA journey of Max Healthcare began with 3 processes in areas where maximum impact could be achieved quickly: claims processing and data reconciliation. And the robots delivered on the expectations, by being able to navigate between multiple applications and environments, bringing important money and time savings. The automation reduced 70% turnaround time for claims processing and 65% turnaround time for data reconciliation processes, also helped recover over 130.000 dollars from pending payments over 1 year.

***The Copenhagen Municipality*** is the largest municipality in Denmark and one of the four municipalities that constitute the capital of Denmark. It serves more than 630,000 inhabitants living in Copenhagen's historical city center and the neighboring areas. As the city expands rapidly, the municipality's staff has to maintain the high-quality service for a growing population (over 20% over the last 10 years), and with the same or even a reduced budget. And although the Municipality was highly digitized, they knew how difficult it was to integrate between different applications and environments. And this is where RPA delivered, with its unique ability to go through data, work between systems and skip integrations. The Copenhagen Municipality started a pilot with automating the entire paperwork for an HR process which was already digitized. The pilot convinced them that RPA was the solution, so they started scaling by setting up an internal Center of Excellence and gradually increasing the number of automations and robots, all while investing into building the excitement for RPA across the organization. This translated into many staff members upskilling with the free resources from UiPath Academy. Also led to the existence of 54 robots serving the employees, 75 key business processes were automated and 8.500 hours per year were saved for a single process automated.

***American Fidelity*** is an insurance company focused on teachers, the public sector, and other groups that offers benefits strategies to empower customers to make the best benefits decisions possible. American Fidelity is constantly on the lookout for new ways to automate and streamline important processes, especially those that help it provide better customer service. The RPA story started with a proof of concept - an automation built in less than one week to move data from the mainframe to a spreadsheet. It was a hit, and the employee who was responsible for the task was thrilled of the outcome. The company then quickly automated other several other tasks related to customer-facing processes, and now moved to integrate RPA with machine learning in order to tackle cognitive processes, such as customer email classification. As a result, 10 intelligent automations were deployed, combining RPA with automated machine learning, the accuracy grew to 100% in tailored content for clients and over 100 tasks were automated.

Seeing these examples we can conclude that we can apply automation in any industry as each of them has automation potential and the automation benefits are far more than just saving costs:

1. Automation is industry agnostic - no matter how you look at it, there are

automation use-cases in any business.

1. Automation doesn't just impact revenue and time - automating repetitive

tasks also leads to an improved customer and employee experience, eases the AI operations, ensures compliance, and makes the decision-making process faster.

## What are the challenges of RPA?

There are a number of challenges related to RPA, which have limited its use.

***Scalability***. Enterprises have struggled to scale RPA automation initiatives because, although RPA's software bots are relatively easy to implement, they can be hard to govern and manage and therefore hard to scale.

***Limited abilities.*** While its name includes the words "process automation," many critics have pointed out that RPA software tools automate tasks. More work is often required to stitch multiple tasks together into a process. Craig Le Clair, an analyst at Forrester Research, has cautioned enterprises to observe the "rule of five" in building RPA applications because they tend to break when a bot must make more than five decisions, manipulate more than five apps or make more than 500 clicks.

***Security.*** RPA bots sometimes need to access sensitive information to complete their tasks. If they are compromised, they pose an additional security risk for firms.

***Limited resiliency.*** RPA failures can occur when applications change in ways that are not anticipated by developers.

***New QA issues.*** Bots require a variety of new QA practices to ensure they continue to work as intended.

***Privacy.*** Bots may be involved in working with personally identifiable information governed by privacy requirements. Teams need to ensure this data is processed in conformance with local data protection laws such as GDPR. For example, if an RPA bot moved data outside of a given country without encryption that would be a violation of Article 44 of GDPR. RPA vendors are starting to seek ISO 27701 certification as a foundation for managing sensitive information.

***Efficiency.*** RPA bots manually plod through an application in the same way a human does. This may not be as efficient as automating applications through APIs or workflow automations baked into the application itself.

## Test Automation using RPA

# **CHAPTER 2. Development Tools**



## UiPath Company

The company started in 2005 as a 10-people team based in Bucharest, led by Daniel Dines. In the beginning, we outsourced automation libraries and software to some of the world’s biggest companies.

## UiPath Products

## UiPath Studio

# **CHAPTER 3. Automation Testing with UiPath Studio**

# **CONCLUSIONS**

# **Bibliography**

**No table of figures entries found.**

1. ROI is the figure for return on investment [↑](#footnote-ref-1)