Editor: **Michiel van Genuchten**
VitalHealth Software
genuchten@ieee.org

Editor: **Les Hatton**
Oakwood Computing Associates
lesh@oakcomp.co.uk

Are Robots Taking Our Jobs? A RoboPlatform at a Bank

Przemysław Lewicki, Jacek Tochowicz, and Jeroen van Genuchten

From the Editors

Robots dominate some Hollywood movies and economic journals. This article describes the impact of software robots in a Polish bank.

—Michiel van Genuchten and Les Hatton

AUTOMATION HAS BEEN replacing manual activities in workplace for decades. Robots had been most active in blue-collar industrial manufacturing. Now that they are entering white-collar jobs, in the form of software taking over administrative work, it is time to ask the following questions.

- Are these real robots?
- Why do we need them?
- Are they going to take over all jobs once self-learning algorithms mature?

We will try to answer these questions by analyzing the deployment of the self-build RoboPlatform at ING Slaski Bank in Poland.

Robotic Process Automation

Robotic process automation (RPA) mimics human administrative actions. The software robot receives a digital form or email and processes the requests by following a script. It reads the incoming data, opens screens, and enters data, just as a human would. The robots can operate in the following two modes.

- *Attended*: A robotic digital assistant resides on the desktop, and the human employee can trigger it to work on repetitive, mundane tasks while he or she works on other things.
- *Unattended*: The robot works autonomously under its own credentials on scheduled tasks.

RPA is a booming business. Everest Group[2] states that RPA adoption exceeded 100% growth in 2017, buoyed by new buyers of all sizes and industries. Forrester[3] predicted that the RPA market, which was only US$250 million in 2016, would grow to US$2.9 billion in 2021.

As is the case for other companies, ING wants to increase the speed and accuracy of its processes, enhance the customer experience, and reduce costs. In business processes, system limitations are difficult to overcome and stretch across many applications in the organization. ING is investing in global core banking platforms, but these complex transition programs take years to accomplish. In the meantime, you can deliver digital solutions with RPA, and leave your legacy software and business processes largely untouched.

Use Cases

ING Slaski, a bank in Poland that has 4.5 million customers, started to use RPA 10 years ago. Back then, the need for an end-user computing platform led to the implementation of MacroPlatform. From then on, staff at Slaski could outsource the task of retyping the details for a personal loan or current account from the mainframe

Digital Object Identifier 10.1109/MS.2019.2897337
Date of publication: 16 April 2019

application into an Excel file to a MacroPlatform script. With the successor RoboPlatform, the customer support specialist can have an engaging conversation with the customer on the phone while the robot retrieves all the customer data from various applications and presents it in one overview. RoboPlatform increases efficiency and reaction speed; on average, it completes scripts 5.5 times faster than an employee would. With more than 1,600 scripts in production, the impact for Slaski's operations is considerable. More than 700 of Slaski's 1,100 total operations and customer support employees use RoboPlatform as part of their daily activities. Since the robotic capacity is the same as 70 full-time equivalents' manual work, the bank was able to grow its business and comply with increasing regulatory demands without hiring additional staff. In addition to the improved speed and efficiency, the robots are more accurate also, assuming the virtual machines are running and the scripts were developed correctly. Robots work on customer due diligence tasks dutifully and can log and store all required auditable data without mistakes. The robots do not have bad days, let alone hangovers or broken hearts. RoboPlatform also is an integration solution between applications. Output products from applications can be passed on to the business lending backoffice application using RoboPlatform.

Make or Buy?

There were no standard RPA products on the market 10 years ago. The initial version used Pascal as a programming language for the product and the scripts. Two years ago, MacroPlatform was fully rebuilt using .NET technology and transferred into the RoboPlatform RPA product. Scripting can now be done in Pascal, C#, or Visual Basic, and the RoboPlatform is 140 KLOC.

When Slaski decided to rebuild MacroPlatform into RoboPlatform, we took a close look at the solutions that were available to purchase. The biggest disadvantage of moving to an external vendor was that there was no way to incorporate the existing MacroPlatform scripts into these external products without rebuilding them almost completely. Since our business is banking, the highest standards for security and credential management are necessary. The new product should be enterprise ready, such as supporting role-based access by integrating with our central directory services (Microsoft Active Directory). We concluded that the external RPA vendors were not mature enough at the time. Also, the yearly license fees for the large number of robots needed could be more than US$1 million, which would destroy our return on investment. Therefore, we decided to leverage on our RPA experience.

We built most of the RoboPlatform components inhouse, including state machine implementation and workflow implementation. We built a full debugger as well as a simple code review tool. We developed components for multisession mode, for when the scripts do not require a graphical interface. There is risk assessment and monitoring of scripts to identify errors and irregularities, and a screenshot capturing tool is active during the session.

We use about 200 open libraries. The most important are FreeRDP, AvalonDock, CefGlue, MaterialDesign + MahApps.Metro, Selenium, Microsoft.Build, Rolsyn, NRefactory, Fusion, Microsoft IUIAutomation, Reactive Extensions, FluentScheduler, Vault, EntityFramework, Dapper, JQuery, Bootstrap, Bootstrap, SinglarR, AutoMapper, Newtonsoft. Json, Caliburn.Micro, SimpleInjector, LightInject, and Accord.

RoboPlatform consists of three main modules.

- *MachineHeartbeat*: This Windows service is responsible for managing the machines on which the robots are running. It keeps track of the machines' activity status and monitors queued tasks that need to be processed in unattended mode, to make sure that the machines are ready and available. It manages logging into the Robot account, and the password that is downloaded from the password vault.
- *Engine*: The console application is responsible for the correct execution of C#, VB, Pascal, and Workflow scripts. The engine also sends logs to BotSlave.
- *BotSlave*: This console application starts Bots (a script or set of scripts) after a successful login. Its task is to start the Engine application in a timely manner, to log the actions performed by running the script, and to log out of the robot account after the task has been completed.

Robot Resource System

Our unattended robots do not get a salary, access badge, or holidays, but they need authorization to be able to work in specific applications, just like humans. They also need a manager who is accountable for their actions. Therefore, we introduced the Robot Resource System (RRS), built in .NET, where all robot accounts that are in use within ING globally are registered (Figure 1). The RRS feeds all of the applications that are already in place for identity access management. The RRS connects to a password vault where the robots' passwords are securely stored.

RoboPlatform will fetch the passwords from the vault when the script requires a login into the network. In this way, no human needs to know the password for the robot account, unless there is an emergency (e.g., a robot malfunctioning).

Agile

Multiple roles within the organization use the RoboPlatform ecosystem. The end user triggers scripts, the IT custodian and operations manager monitor performance by using the dashboard, and the scheduler plans the work of unattended robots. The process owner promotes new scripts to production, while the software engineer develops and tests new features and functionalities of the core product, and the script developer uses the environment to develop and test the scripts. This process intensifies the collaboration among all the disciplines and promotes an agile way of working, making sure that RoboPlatform improves continuously.

Adding a new feature to RoboPlatform can take a few hours up to few months. To speed the script development process up, we have added the ability to create reusable components (called *metabots*) that the software developers can develop and that the script developers can use easily and quickly.

Recent Developments

The current generation of robots still are, for the most part, unintelligent virtual employees that dutifully follow rule-based scripts. RPA robots only work with bite-sized chunks of structured digital input. They cannot do much with a piece of paper or a pdf. We currently are making RoboPlatform smarter by letting it understand semistructured data, so the product can extract relevant data points for further processing. Self-learning classification algorithms are used; for example, a machine-learning model that simplifies plain unstructured text can be easily transformed into vectors and then classified by statistical methods, such as term frequency–inversed document frequency. In this way, we can dissect the required data points of items such as annual reports, salary slips, invoices, and income statements and then feed them to the robot in a structured file for further processing. We are enabling the use of the Python programming language to RoboPlatform, allowing developers to add data analytics to the scripts. We recently developed the complaints analyzer, a machine-learning module that supports customer advisors by prompting answers from past conversations. We are experimenting with natural language processing, to be able to interpret unstructured input such as legal contracts.

Talking about jobs in danger, we introduced the so-called blocks functionality in the newest RoboPlatform version: by simply dragging and dropping prebuilt metabots, users can build robot scripts themselves. For simple scripts, there is no need to ask a software developer to do the work anymore.

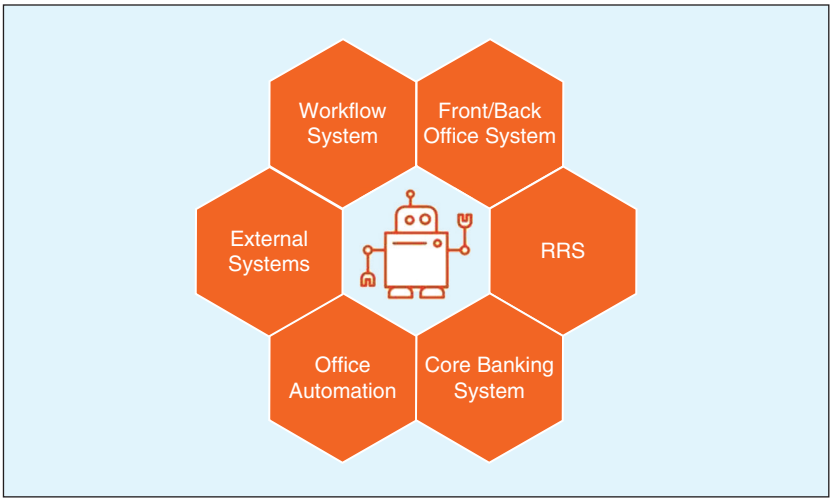

FIGURE 1. The robots within context.

Taking Robots Global

ING decided to form a global RPA community two years ago. In this way, the bank can build toward global standards and global solutions for RPA. ING Slaski created the Robotics as a Service platform and the Robot Resource System in the bank's private cloud. The IT custodian and scripting teams can now provide RPA services globally. A good example of best of breed is integrating the RoboPlatform and a workload manager that ING Netherlands developed to manage the 3 million annual customer requests that 100 unattended robots process. This so-called Spider manages the workload based on service-level agreements, ensures secure storage of audit trails and log files, and enables robots and humans to interact. Whenever a robot is not able to finish a task that Spider assigned, the robot will pass the unfinished requests back to Spider, who then assigns the task to a human employee.

Beyond Banking

To remain competitive in software, volume is the key.[5] Many businesses and applications can apply RPA.

This article originally appeared in IEEE Software, *vol. 36, no. 3, 2019.*

ABOUT THE AUTHORS

PRZEMYSŁAW LEWICKI is a director of the Operational Digital Transformation Center and head of Robotics at ING Bank Śląski. Contact him at przemyslaw.lewicki@ingbank.pl.

JACEK TOCHOWICZ is a manager of the Robotic Process Automation Team at ING Bank Śląski. Contact him at jacek.tochowicz@ingbank.pl.

JEROEN VAN GENUCHTEN is the global robotics product owner at ING Bank, The Netherlands. Contact him at jeroen.van.genuchten@ing.com.

As a bank, we can help customers with our knowledge of and experience with RPA and the product RoboPlatform that comes with it. We are now implementing a proof of concept with a number of corporate customers by allowing RoboPlatform to improve their own administrative processes. Applications are plentiful. We imagine expanding our robots' roles to be effective employees in other financial industries, medical applications, and public systems.

Rogue robots and robots building robots have inspired many Hollywood movies. Their impact on the economy and employment is a topic of attention in science and policy making.[4,6] Here we have discussed one example of what is happening today and what we expect in the near future. The final question to answer is whether robots will take over our jobs. Robots will replace some jobs, and some new tasks will be assigned to robots from the start. At the same time, humans will be needed to build and control the robots. We believe that the combination of human beings and robots is the strongest model, in which employees can focus on customer-oriented activities while the robot does the mundane work. With the rise of smarter artificial intelligence algorithms, the portion of work that robots can do will increase, enabling humans to focus increasingly on important things. We hope employees can be trained to become business translators, supervising the algorithms and telling them what data to use and how to interpret it. This robot model also applies to the software engineers and software: the end user will be more accustomed to building its own software using prebuilt blocks. However, software engineers will create the building blocks in years to come and, for the complicated scripts, we will need human intelligence in the foreseeable future.

References

1. Gartner. Accessed on: Oct. 3, 2018. [Online]. Available: https://www.gartner.com/en/newsroom/press-releases/2018-10-03-gartner-says-robotics-to-become-mainstream-in-finance-departments-by-2020
2. Everest Group, "Enterprise adoption of RPA exceeds 100% growth in 2017, buoyed by new buyers of all sizes, industries," Accessed on: Apr. 2018. [Online]. Available: https://markets.businessinsider.com/news/stocks/enterprise-adoption-of-rpa-exceeds-100-growth-in-2017-buoyed-by-new-buyers-of-all-sizes-industries-everest-group-1027389360
3. C. L. Clair, A. Cullen, and M. King, "The RPA market will reach $2.9 billion by 2021," Cambridge, MA: Forrester Research, Inc., Feb. 13, 2017. [Online]. Available: https://www.forrester.com/report/The+RPA+Market+Will+Reach+29+Billion+By+2021/-/E-RES137229#
4. E. Brynjolfsson and A. McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. New York: W.W. Norton, 2016.
5. M. Genuchten and L. Hatton, "Software mileage," *IEEE Softw.*, vol. 28, no. 5, pp. 24–26, 2011.
6. A.-F. Rutkowski, "Work substitution: A neo-Luddite look at software growth," *IEEE Softw.*, vol. 33, no. 3, pp. 101–104, 2016.