

Robotic Automation Process – The operating system for the digital enterprise

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Abstract. *Robotic Process Automation (RPA) is going into a “maturity market”. The main vendor providers surpassed USD 1 billion in evaluation and the research they are launching these days on the market will change again radically the business landscape. It can be seen already what is coming next to RPA: intelligent optical character recognition (IOCR), chat-bots, machine learning, big data analytics, cognitive platforms, anomaly detection, pattern analysis, voice recognition, data classification and many more. As a result the top vendors developed partnerships with the main leading artificial intelligence providers, such as: IBM Watson, Microsoft Artificial Intelligence, Microsoft Cognitive services, blockchain, Google etc. On the business part, the consulting companies who are implementing the RPA solution are moving from developing Proof-of-Concepts (POCs) and Pilots to helping clients with RAP global roll-outs and developing Centre of Excellences (CoE). As a result, the experiences gathered so far by the author on this kind of projects will be tackled also in this paper. In this article will we will present also some data related to automation for different business areas (eg. Accounts Payable, Accounts Receivable etc) and how an assessment can be done correctly in order to decide if a process can be automatized and, if yes, up to which extent (ie. percent). Moreover, through the case studies we will provide (1) how now the RPA is integrated with Artificial Intelligence and Cloud, (2) how can be scaled in order to face hypes, (3) how can interpret data and (4) what savings these technologies can bring to the organizations. All the aforementioned services made Robotics Process Automation a very powerful tool since a year ago when the author did the last research. A process that was mainly not recommended for automation or was partially automated can be now fully automated with more advantages, such as: money, non-FTE savings and fulfillment time.*

Keywords: Robot Process Automation, RPA, controlled workforce, automatization, intelligent optical character recognition.

Introduction

Since the author’s previous research a lot has changed in the past year: UiPath (a Romanian company), one of the leading RPA vendors provider, has raised 30m USD in Series A funding led by Accel (Florea, 2017). Money will be used in expanding faster and positioning itself to conquer a big share of the 9bn EUR – which is expected to be the RPA market in the years to come.

BluePrism, the inventor of RPA, has created a first Operating System for the Digital Enterprise (Moss, 2017), which is an intelligent, connected and controlled workforce. Now

robots are aware of the digital channel, while the platform can work well with Microsoft Artificial Intelligence, blockchain and Microsoft Cognitive Services.

Other complementary services to RPA emerged making automation end-to-end a doable project in the near future. For example, Abbyy is a leading provider of technologies, products, solutions and services for the transformation of unstructured data into structured data leveraging Artificial Intelligence and Machine Learning. Abbyy set the standard in (a) Document recognition, (b) Intelligent capture and (c) NLP Technologies that integrate across the information lifecycle.

This paper is a case study and has at its base the author’s own experience with RPA.

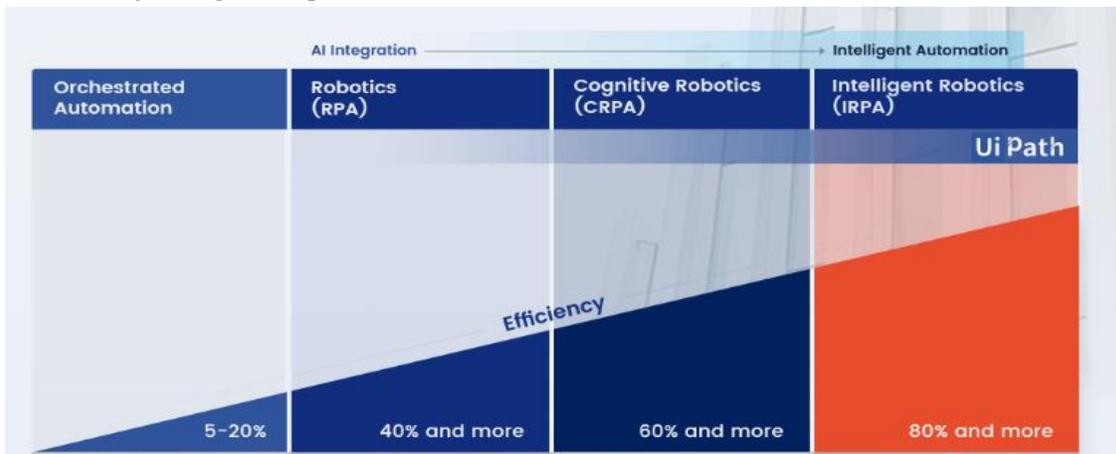
Methodology

The actual paper is based on three business cases developed in the Automation lab of a consulting company. The products represents basic Proof of Concepts (PoCs) or Pilots, which have been deployed to a 700-employees organization, which led to outstanding results. As a consequence, all these automation initiatives became products which the company monetized after carefully improving them.

What has changed for RPA

Horizon 2020

Since my last research (Anagnoste, 2017) in overall terms the RPA market is heading towards Intelligent Robotics (IRPA) where RPA can be integrated with Cognitive and Deep Learning. Among the new activities that the RPA vendors will perform we can name a few: Self-Learning from process discovery, training robots, natural language generation and automated processes documentation generation, Computer vision (AI-screen recognition), cloudfoundry integrated platform and so on.



Application dependent Workflow Automation	RPA replicating actual user activity	RPA with integrated Cognitive Services from Microsoft, Google, ABBYY, etc	RPA with integrated Cognitive and Deep Learning Service
Rule-based	Cross-Application and System Workflow Automation	OCR and Image Integration (incl. complex screen scraping)	Self-Learning for Process Discovery Consolidated RPA Generation
Scripting	Complex Rules	Natural Language Processing, Voice recognition	"Training" not "programming" Robots
Macros	Process Automation of Legacy Systems	Cognitive Virtual Assistans	Natural Language Generation and automated process documentation generation
BPM	User Activity Replication	Voice Assistants (Google Assistant, Alexa, etc)	Computer Vision (AI-Screen Recognition)
Orchestrated Automation		Cognitive Computer Vision	Cloudfoundry integrated Platform
System Interface and API dependent		Dynamic Case Management Integration	

Figure 1. Towards Intelligent Automation

Source: www.uipath.com.

In *Figure 1* you can find the timescale reachable for these new services, as described by UiPath.

Hopefully, all of them will pass the test of usability, that is, it will be used by the business unlike technologies like blockchain that although are on the market for ten years they it couldn't find a place in the day to day business life (Stintchcome, 2017).

From Pilot to Roll-out

In the whitepaper "*Crossing the chasm: from pilot to a full scale RPA Deployment*" (Moayed, 2017) the author summarizes how companies should implement a Global RPA deployment without making major mistakes, which in the end translates in lost money and frustration among employees. Here is the list of the top ten common pitfalls that the author of the white paper has identified on projects led by himself all over the world:

- *Having a solely tactical approach to RPA*: Seeing RPA the best and only solution to automate through a company's internal and external systems. RPA does that but one need to take in consideration what a "quick win" means and how much of a process can you really automate
- *Considering RPA as an IT only topic*: since in most of the cases IT department is not the beneficiary of such change his leading and involvement should be accordingly. The work is done using Agile methodology, one of which, cannot be their best option. On top of that, skills and motivation might be an issue.
- *Forgetting about IT*: it's mandatory to have IT aligned on any RPA decision because you will need them when the deployment is done, and once you have a Center of Excellence (CoE) ongoing
- *Not selected carefully enough the best processes to automate*: a Process Analyst can confirm/infirm which processes are good to automate. This conclusion comes from the experience on many industries (e.g. FMCG, Banking, Oli&Gas etc.) or different business functions (IT, Human Resources, Sales, Procurement etc.). A crystal-clear methodology

will which may imply also process redesign it's a must and should be done from day one.

- *Wanting to automate too much of a process*: as we will see later in the paper, some processes are automatable 70%, other 80% and other less than that. Trying to go 100% covering all the exceptions might end in the end might be time consuming (*ie. money*) and hard to maintain (*ie. again money*). In these cases maybe a process redesign can improve the percent but up to a limit, depending from case to case.
- *Underestimating the skills required for a full roll-out of RPA*: being a new technology the talent is scarce. Although that certain path exists (*e.g. from training a Proof of concept to Pilot and then to Global Roll Out*), the author hasn't seen replicated successfully so far without external help (*e.g. professional firms*). If an organization decides to have internal knowledge it will be a good idea to go in parallel with the help of an external company.
- *Overestimating the ROI of an RPA program and justify it solely on Full Time Employee (FTE) reductions*: seeing all the results desired from the beginning will be challenging. But on the medium term they will pay off and will translate in fewer FTEs, fewer mistakes, less overtime and more time allocated to highly value adding tasks.
- *Underestimating the stakeholder management effort*: ultimately, automation can scary people. An appropriate communication program should be put in place for those who will be affected directly. RPA deployment can fail or slow down if not all the stakeholders are on the same boat.
- *Using an inappropriate delivery method*: applying rationally software implementation with big spending and long cycle of ROI is not applicable to RPA. Instead, an Agile methodology will allow processes to be developed in 3 to 5 weeks, depending on complexity.
- *Not having a plan in place to roll-out and sustain automation*: without a preparation and the support of C-suite any long term success will not happen

What can be automatized an in which area?

The first question clients asks is "*How much can I automate?*". Well, it depends. Some industries and some business functions are more prone than others. In the table below developed by Everest Group, a management and research company, the following industries were leading in the automation race: Banking and Financial Services, Insurance and Healthcare. In terms of business functions we can name a few: Cards activation, Frauds claims discovery, Claims processing, New business preparation, Reports automation, System reconciliation etc.:

Table 1. RPA adoption potential by buyer industry and function

Function	Finance & Accounting	Procurement	Human resource	Contact center	Industry specific processes	
Industry	Accounts receivables, accounts payable, general ledger	Invoice processing, requisition-to-purchase order	Payroll, hiring, candidate management	Customer service		
Banking & financial services						<ul style="list-style-type: none"> ✓ Cards activation ✓ Frauds claims
Insurance						<ul style="list-style-type: none"> ✓ Claims processing ✓ New business preparation
Healthcare						<ul style="list-style-type: none"> ✓ Reports automation ✓ System reconciliation
Manufacturing						<ul style="list-style-type: none"> ✓ Bills of material generation
Hi-tech & Telecom						<ul style="list-style-type: none"> ✓ Service order management ✓ Quality reporting
Energy & utilities						<ul style="list-style-type: none"> ✓ Account setup ✓ Meter-reading validation

Potential for RPA
 Low High
 Illustrative processes with higher potential

Source: Author's own research.

Everything can be automatized if all the technologies are put in place, as represented in *Figure 2* below:

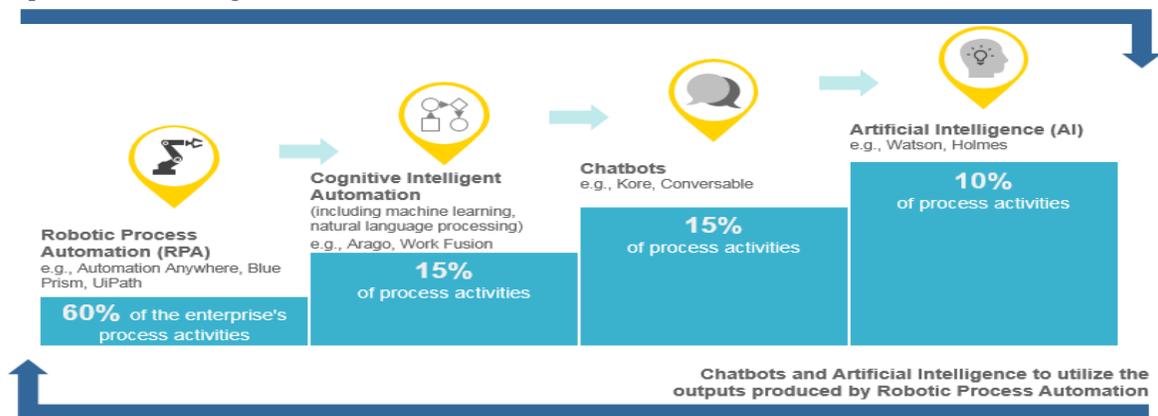


Figure 2. Towards Intelligent Automation

Source: Author's own research.

RPA cannot do all the automation and it needs to be helped in this process by Cognitive Intelligent Automation, Chatbots and Artificial Intelligence. Of course, it might be necessary a process redesign in order to handle some exceptions or paper/manual input, but the future versions of all technologies aforementioned will be available by 2020.

Table 2. Typically asked questions for assessing the automation potential

Criteria	Question
Digital data availability	What percent of data are available in digital format?
Data source quality	Where are the major source of data quality errors?
Effort to execute	How many FTEs are required to execute the process/task? How many different individuals are involved?
Time to execute	What is the average time required to execute the process/task? How much of that time is spent “waiting” on information, system processing, etc.?
Average FTE cost	What is the average cost of FTEs executing the process?
Data protection prevents offshoring	Are any processes prevented from being offshored due to regulatory constraints?
Ownership of process	Who is accountable for the end to end process?
Existing process automation	What level of automation currently exists? How many systems, applications (including Access dBs, Excel spreadsheets/workbooks, OCR, etc.) are used in the process? What percent of the process is performed manually vs. automated?
Interaction channel	How do you communicate with your customers and how do they communicate with you?
Process complexity	How complex are the processes being performed, and do they require a lot of specialist knowledge? Are subjective decisions made by specialists or are decisions based on pre-defined rules?
Workload volume and growth	What is the current transaction volume? How fast is the workload growth in terms of year on year transactions growth?
System change	How frequently are the development cycle/system updates/bug fixes/new releases of the core systems/applications used in the process?
Change portfolio	Are there any major transformation programs taking place in your area?

Source: Author’s own research.

What can be automated and how much is determined via Questions & Answers session with the process owners. Typically, these questions will arise (please, see *Table 2*).

With more than 30 RPA projects deployed by my team in the last year a pattern arose in terms of what can be automated, the potential savings and if can be a quick win or not (*Table 3*):

Table 3. Potential automation by business function

Function	Sub-process	Process automation potential (%)	Potential time savings	Quick win
General accounting	▶ Fixed aassets / FMM / closing and reporting	25%–30%	10%–15%	Yes
	▶ Local tax accounting	10%–15%		No
Controlling	▶ Costing	5%–10%	15%–20%	No
	▶ CO operation/reporting	10%–15%		
	▶ Business controlling support	5%–10%		
	▶ BI and systems	10%–15%		

	▶ Group financial controlling	5%–10%		
Finance (other)	▶ Intercompany	25%–30%	30%–50%	Yes
	▶ Account and bank reconciliations	15%–20%		No
	▶ Financial planning and analysis	25%–50%		No
	▶ Tax	40%–60%		Yes
Order to cash	▶ Customer master data management	25%–30%	40%–60%	Yes
	▶ Credit management	25%–30%		Yes
	▶ Customer service support	25%–30%		Yes
	▶ Account receivables management	25%–30%		Yes
	▶ Incoming payments	0%–5%		No
	▶ Deductions and disputes management	25%–30%		Yes
Human resources	▶ HR general services	25%–30%	60%–80%	Yes
	▶ Expat management	10%–15%		No
Source to pay	▶ Source to purchase	25%–30%	50%–70%	Yes
	▶ Purchase to Pay	25%–30%		Yes
	▶ Projects support	10%–15%		Yes
Supply chain	▶ Supply chain planning	10%–15%	10%–15%	No
	▶ Transport planning	10%–15%		No
	▶ Supply planning	10%–15%		No
	▶ Project management	10%–15%		No
	▶ General supply chain services	10%–15%		No

Source: Author's own research.

Because most of the RPA project have been in the area finance and supply chain the following hot spots are recommended to automate:

Finance

- Accounts receivable:
 - Credit approvals and customer master file maintenance
 - Order processing
 - Cash receipts processing and sending late notices via e-mail
- Accounts payable:
 - Vendor setup and maintenance
 - Automating the workflow processes and approvals
 - Data entry and payments preparation
 - Automating processing of payments and bulk payment files for journal entries to subsystem
- Financial planning and analysis:
 - Pre-population of forecasts using historical and market data
 - Loading pre-populated balances into the planning system
 - Creating variance reports to pre-population and to actuals

- Regulatory and management reporting:
 - o Data capture and cleansing to support automated generation of regulatory reports
 - o Pre-populating complex annual reporting
 - o Automating the preparation of management review slide decks by collecting data from multiple finance systems and reports
- Expense reimbursement:
 - o Calculation of purchase discounts
 - o Compliance and management reporting
- Intercompany reconciliation:
 - o Automated checking and reconciliation of intercompany balances
 - o Basic research and reporting for exceptions
 - o Creating exception file and email report for finance review and approval
- Operational finance and accounting:
 - o Automating the collection of data for leases or revenue transactions
 - o Categorizing, summarizing and analysing data based on history and pre-established parameters
 - o Producing reports for internal analysis
 - o Automating pricing reviews based on customer contracts and preapproved price lists
 - o Calculating and processing discounts
 - o Downloading of detailed monthly sales data and calculation of commissions
 - o Creating files and emails to gain approvals
 - o Posting to detailed subsystems and General Ledger
- Journal entries:
 - o Creating standard monthly journal entries using pre-populated templates provided by different business users
 - o Performing validation analytics
 - o Posting to ERP
- Account and bank reconciliations:
 - o Automating the download of subaccount balances and bank statements
 - o Uploading detailed transaction data from various subsystems
 - o Reconciling balances and transactions to core finance subsystems
 - o Creating balancing journal entries to handle discrepancies

Supply chain – source to pay:

- Spend analytics and reporting
 - o Data capture and cleansing to support automated generation of reports
 - o Pre-populating complex periodic reporting requirements

- Scorecards and dashboards
 - o Create dashboards and scorecards
 - o Collect data from multiples sources
 - o Archive data for multi-period analysis
- Requisition to pay
 - o Buying channel optimization
 - o Automate the Purchase Order processes from creation to approval
 - o Matching and reconciliation of invoice and goods receipt
- Travel and expense management
 - o Processing of standard expenses
 - o Auto-approval of standard expenses
- Procurement data management
 - o Material master data management
 - o Contract data management
 - o Vendor master data management
 - o Bill of materials updates
- Category management
 - o Automating the categorization and processing of spend categories to set strategy and monitor performance
 - o Creating automated reporting and workbooks as key strategy inputs
- Contract management
 - o Automating contract creation, updates and management of contract
 - o Ongoing contract compliance and monitoring
- Strategic sourcing
 - o Automation of supplier market research and analysis
 - o Identify and select suppliers based on predefined criteria
 - o Automation of reverse auctions
- Supplier relationship management
 - o Supplier qualification and setup
 - o Advanced shipping notifications
 - o Supplier portal updates and integration with internal systems and 3rd party systems
 - o Automation and integration of other key performance management data (on-time delivery, quality, cost, etc.)
- Supplier risk management
 - o Complex/outsourcing contract compliance management
 - o Inbound product quality testing and compliance reporting
 - o Monitoring and real-time notification of risk events
 - o Ongoing operational risk management (e.g. financial, legal, reputational, etc.).

Case studies

RPA and Chatbots

According to the website www.webopedia.com a Chatbots is “a computer program that simulates human conversation, or chat, through artificial intelligence” or simply put it chatbots are interacting with humans through text or voice in a way that it’s resembling a natural conversation between two people. They work on based rule interaction that means they can simply reply with an answer or they can do specific tasks for the user. Empowered by Artificial Intelligence a chatbot can free up a lot of admin time in departments like Human Resources (HR) or Information Technology (IT) making the internal processes smoothly and far superior than the previous experiences.

During the pilot phase of RPA and Chatbots we observed that this solution in better form multiple points of view:

- Creating a new communication channel
- Increase engagement with your customers (internal or external)
- Less stress on operational tasks
- Connect the whole organization from an IT perspective
- Etc

Since the world is moving to a new preferred way of communication based on messaging though chat applications (*e.g. Messenger, Whatsapp etc.*) chatbots are a technology that can be easily and with low budgets in our day-to-day life, especially in business. First introduced with educational purposes, now they start to appear more on more in organizations too. New Artificial Intelligence technologies, machine learning and neuronal capacities can now transform a chatbot into an unobservable human.

Garner estimates that by 2020 approx. 85% of interactions will be made through chatbots (Garner, 2011), which is another validation for those 34,000 chatbots that are improving the social media experience. (O’Brien, 2016)

Because these solutions help conversations be more efficient and purposeful they will hugely impact the global organizations. At this moment Chatbots help financial institutions dealing with customer engagement, but employee communication and help-desk support are next on the list (Davidge, 2016)

In order to boost productivity organizations have begun introducing virtual agents backed by AI and machine learning in order to conversational sentences that lead to redundant and mundane work, assuring a higher productivity (Petthey, 2017)

In the paper “Chatbot revolution: Reimagining the enterprise service desk” (Hatch, 2017), EY has summarized the key features of chatbots:

- Reduced operational pressure: chatbots will answer to repetitive questions and learning how to improve using machine learning
- Low IT operating costs: low costs from eliminating other IT applications and the human support attached to it

- Broad applicability across the organization: every process that is repeatable and has a rule based decision behind is prone to automation
- Continuous improvement: backed by AI, the chatbot will learn from each user the way he puts questions and what he really wants
- Driven by end-user: the person who makes the inquiry drives the conversation
- Personality: companies “decide on the personality and human qualities of the bot”

When we considered starting a pilot internally in EY for RPA and chatbots we looked primarily at these three benefits:

- i. *Lower costs* – Garner, a research company, estimated that 20% to 30% of internal company tickets are related to low-priority issues (Garner, 2010). These issue mean time spent on filling in complex or lengthy IT internal systems, written emails, phone calls or meetings, which can be easily handled by a machine learning solution which in the end will mean that an IT person can focus on more highly value added tasks
- ii. *Increased efficiency*: being there to help you 24/7 means a lot when you compared to the fact that it takes approximate eight months to for new employees to reach full productivity (Feranzzi, 2015) and that is a lot by all standards. In addition to that IT people have the tendency to leave the organizations when their work is not engaging anymore.
- iii. *Improved end-user satisfaction*: having all the information in a bot makes find it and share it very easily. Vast amounts of time are spent daily and annually by employees to find the information they need (Feldman, 2004).

Below are some concrete examples where this kind of personal assistant can help:

- *IT department*: each time a problem arise (*e.g. blocked password etc.*) you have to raise an electronic ticket, in the best case scenario. On the worse case, you need to pay a visit to the IT department. This kind of interaction is not a great experience for your employees and surely not a best practice in 21st century.
By incorporating a virtual assistant the IT department can handle those repetitive tasks and focusing on the highly-value added tasks. Once the virtual assistant can't answer it can escalate the issue to an IT person. By doing so and backed by machine learning the virtual assistant can learn from these situations and solve by itself in the future those kind of requests.
- *HR Department*: when it comes to Human Resources the most time consuming repetitive processes are mainly related to on boarding of new employees. This can means going back on forth to multiple systems, interfaces, etc. and the appearance of chatbots and RPA is really welcomed when you are working, for example, in an industry with high attrition rate (*e.g. consulting services*).

Other areas in HR which can benefit from these are related to enrolling employees to trainings (e.g. financial certifications, soft skills certification etc.) or recruiting new candidates on the pre-screening phase.

- *Public Relations Department*: intranet portals where information and news are stored are obsolete. Chatbots have already proven successfully in delivering news using chat-messaging interfaces.
- *Knowledge management* is something that should be everyone’s business in a company, so by asking a chatbot instead of going through multiple sources is much easier.

My RPA team in EY applied the Chatbots and RPA in the HR department for automating the enrolling to trainings and here are the results:

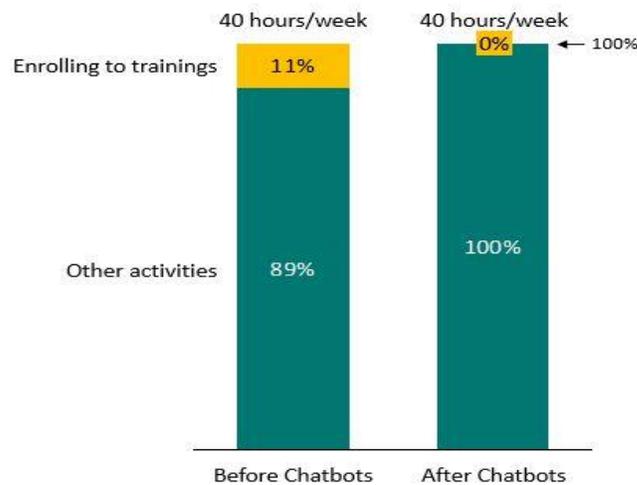


Figure 3. Automation potential in HR using Chatbots

Source: Author’s own research.

The assumptions were that if a company like EY Romania has 700 employees and each of them must enroll to six mandatory trainings per year just enrolling for each one will take a HR Business Partner approximately eight minutes. If we extract the number of days allowed for vacation and public holidays it will result 11% of their time spent on doing this repetitive task. In terms of savings, on average a HR Business Partner is paid with 1,800 EUR gross per month (Mihai, 2017), so yearly 11% means around 2,300 EUR which can be better allocated.

RPA and Intelligent OCR

The researchers from McKinsey Global Institute estimate that between 25 – 30% of a worker from knowledge economy is used searching for information or analyzing sources

(Chui, 2012). Moreover, IDC estimates that 61% of workers access four or more systems (IDC, 2014).

It is important to realize that data purely means raw data, while information represents facts provided or learned about someone or something. Below are the steps of information driven business processes (*Table 4*):

Table 4. Information’s flow in an organization

Capture	Classify	Extract	Route
The information generated through processes through scanners etc	Classification is used to identify what type of document it is	Certain data can be extracted according to predefined rules	Send the document on route according to the predefined rules

Source: Author’s own research.

At the 2nd Automation conference organized by EY Romania in November 2017, Abbyy – an Intelligent OCR provider presented how RPA and IOCR were involved in Automation-as-a-service (*ex: claims, invoices, orders etc.*):

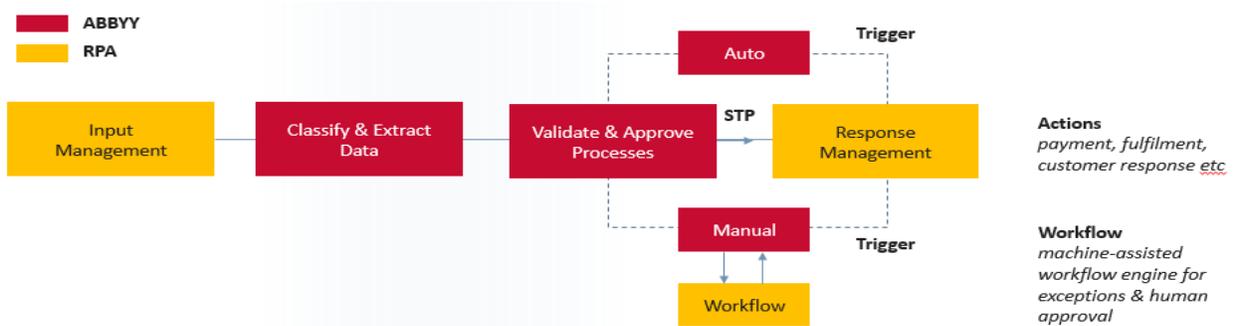


Figure 4. Business flow automated with Abbyy

Source: EY Romania Automation Conference, 26th October 2017.

After applying the new Intelligent OCR Abbyy presented the results (see below in *Figure 5*):

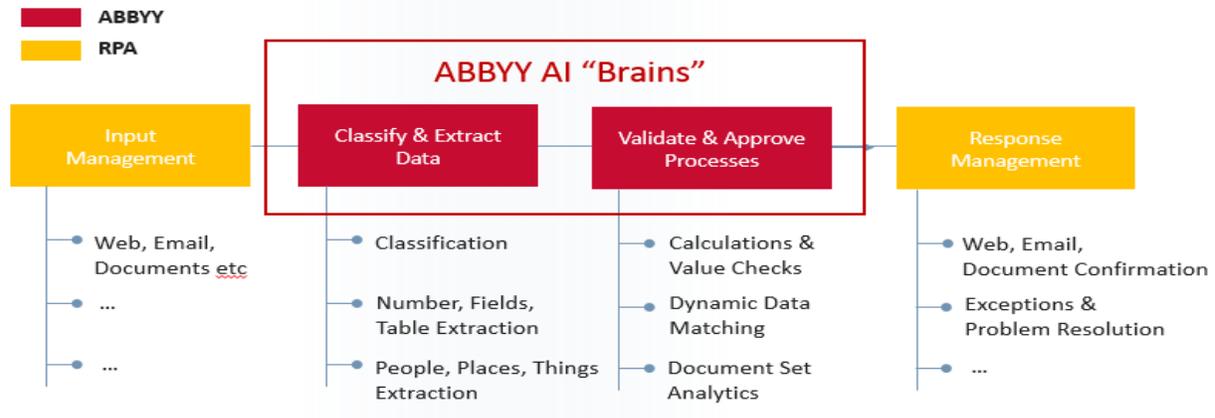


Figure 5. Business flow automated with Intelligent OCR from Abbyy

Source: EY Romania Automation Conference, 26th October 2017.

In this case study AI driven capture and RPA were used to process a vendor information for a company in fast-moving-consumer-good (FMCG) market. This was done taking in consideration two steps:

- A check is performed for each on-boarding requirement in order to make sure all documents are available
- The key data captured in order to be used in companies ERPs

On this specific assignment Abbyy FlexiCapture is used in order to make sure all the documents are available. After the data extraction the output is arranged in a specific format so that the RPA tool (e.g. UiPath, BluePrism, Automation Anywhere etc) can work further with the data.

Accuracy gets better with time because Abbyy FlexiCapture machine learning so the classification of document type is done 100% correct. Of course, the exceptions remain to be handled by humans but this will change with time too because where is not a new tool handling those a process redesign works too.

Conclusions

- a) *These technologies are still in the early days*, if we are speaking of Chatbots and Intelligent OCR, but moving from decision trees to natural language recognition it's a matter of a couple of years right now.
- b) *Chatbots versus search* – as previously states, it is much easier (i) to request to a bot where to find a specific document, (ii) to register you to a course or (iii) to reset a password than going online or offline to get those things done
- c) *Jobs will be eliminated*, but also new jobs will be created – low value jobs will be eliminated. Those specific jobs where causing a lot of challenges to organizations (e.g. low retention, low motivation, low salaries etc). Instead, requalifying for getting the new job created to handle the armies of bots will be a mission for all

organizations. It's much easier and cheaper to requalify a person than hiring a new one.

- d) *Accessibility*: all information will be on our device: on a phone or at a wrist band. Having all information in one place means less anxiety, less time spent searching for it and allowing the user to focus on what really matters.
- e) *Efficiency*: work will no longer be attached to a specific place (e.g. *companies' office*) and to a specific timeframe (e.g. 9.00 to 18.00). The whole workplace will be changed radically with people working side by side with robots.
- f) *Digital*: On the labor market are entering Generation Z and Alpha, both of which haven't experienced a life before internet so being able to attract, keep and engage them will require a total different strategy compared to Millennials.

Small, medium or big companies can use RPA, Chabots and Intelligent OCR in their future business activities. Not doing so will mean being left behind by those who do. Because benefits are seen are immediately (three to five weeks) after RPA and Intelligent Automation in general will become the new norm all will wonder how was even possible the work without it.

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