Robotic Process Automation – Current State, Expectations and Challenges

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Abstract: The paper presents the definitions, potential and the future impact of Robotic Process Automation (RPA), automated execution of business processes using special applications called software robots. It compares the emergence of RPA to automatization of manufacturing industry showing their similarities and differences. The deployment of RPA in Polish banks is presented as distinctive area of RPA deployment. At the last part of the paper the potential impact of RPA in BPO services supplied by CEE countries is discussed.

Keywords: AI, business process outsourcing, robonomics, RPA

1 RPA and process automation at business organizations – emergence of robonomics

According to prevalent definitions Robotic Process Automation (RPA) is an automated execution of business processes using special applications called software robots [1]. In its primary and initial occurrence the RPA software executes basic tasks of the workflow as human workers do, i.e. accepting forms, sending a receipt messages, checking the completeness of the form, range of the values and other parameters, filing the form in a folder, extracting the values from fields, applying the values extracted from the form as the input of other applications in the workflow, registering these activities etc. The main aim of using the RPA software was to reduce the burden of repetitive, simple tasks on

employees. This kind of deployment of RPA follows the path accomplished by robots widely used in the various industries since 60's of 20th century. The role of pioneer is played by an automotive manufacturing, which deploys industrial robots in the typical repetitive arduous and noxious tasks as welding and painting car bodies.

In the last 5 few years the RPA extended its presence at the business entities quickly moving from simple automation of repetitive tasks to the robotization of whole workflows and processes. The difference between automation of tasks and the automation of the processes and workflows is substantial – R. B. Freeman aptly remarks: "Today's robotization is not your parents' automation" [2]. The impact of this difference has led to emergence of a new science called *robonomics*. The robonomics – robot-based economy – is defined as an area of economics analysing the influence of robotics on economy, with particular attention to the labour market and the situation of workforce. The key areas of robonomics have been described by John Crews in 2016 in his book "Robonomics – Prepare today for the jobless economy of tomorrow" as an economic system, based on robots, artificial intelligence and (service) automation [3]. Robonomics is an interdisciplinary science investigating the impact of advanced technologies of automation and robotization on economy and organizational aspects of functioning of businesses, mainly on services. By advanced technologies of automation and robotization we mean the technologies using an AI at least to some extent. As a new area of science robonomics has not created its own methodology yet. It relies on achievements of economics and management of business entities, particularly of service industries adapting and utilizing methods and tools of IT, industrial robotics and automation. In its most advanced approach it is applying the advances of cognitivistics and AI.

The main areas of robonomics are:

- research on advanced robotization and automation and its economy aspects,
- research on models of advanced robotization and automation at service business entities,
- research on economic analysis of robotization and automation of service business entities,
- research on effectiveness of organization, management and policies of advanced robotization and automation at service business entities [4].

Industry 4.0 vs. Services 4.0

The objectives of deployment of RPA are evolving. At its first phase it has followed the path travelled by industrial robotics in automotive or electronic manufacturing industry. Similarly to the case of welding and painting the car bodies or soldering the elements on motherboards it has developed from reducing the burden of dull, tedious and repetitive tasks to increasing throughput, accuracy

and quality of execution of tasks. In electronic services this approach means executing the formal control of input data (formats, range of values etc.), transferring the data to next stages of processing in the same application or to the application or humans next in the workflow of business process, gathering the output from the last chain of the process and transferring the result to reports and/or presentation on the webpages.

The main difference between automation and use of robots in industry and in the field of services stems from the nature of services. In the traditional form of automation of manufacturing industry the robotization is deployed in a strictly defined and described manufacturing processes. For welding or soldering robot there is no room for any "invention" - it has to repeat the task or procedure strictly as it has been designed, described and programmed in its controls, with precision in a range of millimetres in a case of welding and painting or nanometres in a case of etching the semiconductor layers in manufacturing of integrated circuits. However a wide range of services cannot (or need not) to be described with such deep level of precision, thus leaving room to the humans making decisions, assisted by software robots. The next step in services is represented by software robots making these decisions autonomously but in order to do so these robots have to be equipped with an elements of artificial intelligence and taught by the means and methods of machine learning (ML). Of course it does not mean that the examples of use AI and ML in a manufacturing industry can't be found. In Industry 4.0 there is huge room for dynamic growth, especially in the fields of optimization – not only in the optimization of manufacturing processes, logistics of supply and distribution chains but in optimization of design of elements and whole devices and machines too. But it seems obvious that design and manufacturing of material objects is more conservative, more limited by its nature and less open to automation than design and execution of immaterial, intangible services.

In his paper "Robonomics – Principles, Benefits, Challenges, Solutions" S. Ivanov collates main characteristics of robonomics [5]. Commenting his findings we would like to emphasize the followings:

- High level of automation of production – people oversee the production but are not involved directly in the manufacturing processes or delivery of services;
- Fewer people work and there is no connection between employment and income. For majority of the people employment is not the major source of incomes for households. Instead they are living on universal citizens' salary provided by government or other public institutions. Those who are working are employed in more knowledge-intensive and higher paid jobs. Most of these jobs are creative and AI-assisted;

- Robots are widely used not only in manufacturing, warehousing, logistics and transport, but provide services and act as assistants and companions to humans and even as sexual partners;
- Robotics enables cost-effective production and delivery of deeply personalized (on-demand) goods and services. It will result in 'abundance economics';
- The main advantage of economy of scale which is very effective in mass production does not necessarily apply to robotized manufacturing and delivering of goods and services. Automated production (including 3D printing) allows not only for on-demand products but also for production in smaller, dispersed automated factories, close to consumers. It results in saving on product delivery time and costs, not only for vendors and buyers but for local SMB suppliers as well;
- High level of standardisation of services as result of use of RPA based on algorithmisation of service provision. Ivanov mentions standardisation of services but in our opinion the crucial momentum is the high level of standardisation of the building elements of services which allows for so called mass personalization of goods and services and thus it is not contradictory to deep personalization of goods and services;
- The main sources of competitive advantages are knowledge and creativity – not high amount labour and capital.

2 RPA and AI

S. Ivanov in his paper collates the pros and cons for applying robots in economy – in general terms, not distinguishing the hardware and software robots.

Table 1. Pros and cons for robots

Why robots?	*Why not robots?*
Robots could work 24/7	Robots lack creativity
Robots could implement various tasks and expand their scope with software and hardware upgrades	Robots will not be any time soon completely independent of human supervision
Robots could provide constant or improving quality of their work	Robots lack personal approach
Robots could fulfil their work correctly and in a timely manner	Robots can orientate in structured situations (at least for the moment)
Robots could do routine work repeatedly	Robots may (will) be perceived as threat by employees (e.g. Neo-Luddism movement)
Robots do not complain, get ill, go on strikes, spread rumours, discriminate, quit their job without notice, show negative emotions, shirk from work	

Source: [5]

It's worth to have a look at AI implemented in software robots used in the field of services today and can be deployed in the nearest or more distant future. Generally we are speaking of three main categories of AI:

- **narrow artificial intelligence** referring to the AI machine solving sophisticated, strictly defined, specific task using ML and deep-learning tools. The example of such solutions are self-learning and self-training programmes designed for playing chess, defeating Go masters, winning in Jeopardy! American game show and finding new planets analysing data taken from the telescopes. First programs using narrow AI were developed decades ago (chess programs, computer games, simulators), this type of AI is used today in many systems, especially in search engines and represent main area of development and deployment of AI;

- **general artificial intelligence** referring to a human-level AI machine able to perform intellectual tasks having the capacity to understand and reason about its environment, applying intelligence to any problem rather than just one specific problem. An examples of this type of AI today still can be seen in SF films (C-3PO and R2-D2 robots in *Star Wars* or HAL 9000 on *2001: A Space Odyssey*) only, but implementation of advances of cognitive science brings general AI closer to practical deployment in various fields of human and machine activities. Such deployment is called cognitive automation, robots equipped with cognitive automation are capable of acting in unpredicted and unstable environment;
- **artificial superintelligence** referring to a machines smarter than the smartest humans in every field, including scientific creativity, general wisdom and social skills. This type of AI – today still considered as SF – is already raising concerns, expressed explicitly in November 2017 by late Stephen Hawking in his interview for *Wired*. [6] In our opinion the danger of outperforming humans seems still to be very distant, a lot bigger danger is the potential for weaponisation of AI.

G. Carrico quotes the words of Carlos Moedas, EU Commissioner for Research, Science and Innovation, who has noted "artificial intelligence is not a threat, how we choose to use it is" [7]. In January 2017 the European Parliament's Committee on Legal Affairs adopted an motion with broad recommendations to the Commission on Civil Law Rules on Robotics to call the EC "to propose common Union definitions of cyber physical systems, autonomous systems, smart autonomous robots", "consider the designation of a European Agency for robotics and artificial intelligence" and "asks the Commission to submit (…) a proposal for a legislative instrument on legal questions related to the development and use of robotics and artificial intelligence foreseeable in the next 10 to 15 years" [8].

3 Distinctive areas of RPA deployment

The first implementations of RPA in businesses were in quite simple tasks in supply chain: matching orders, invoices, payments and deliveries, inventory management, work order and freight management. HR area has followed with payroll, personnel administration and benefits management, ICT with installation of applications and their updates, file and email management, server monitoring, communications channels and media management etc. and sales and marketing with vendor management, sales orders and trend tracking.

Today the widest and most mature implementations of RPA are in the field of finance and accounting as this area is considered most attractive for several reasons:

- relatively easy deployment for repetitive, rules-based processes and processes clearly defined by regulations of financial sector,
- the reduction of the amount of rework and errors,
- substantial reductions in average handling and/or cycle times, which is extremely important for very competitive financial sector.

The deployment of RPA in financial and accounting sector is driven by the need to demonstrate strong controls to the regulators, especially in such areas as anti-money laundering (AML). Banking sector continuously has to improve compliance and reduce risk. Executing the AML procedures and improving the compliance is easier to automate, while risk reduction involves more complex tasks, requiring more human analysis and judgment which can be fried from other fields as a result of implementation of RPA. Risk analysis is an area in which the humans can be effectively aided by RPA solutions. In parallel the deployment of automated procedures is seen by banking sector as potentially effective defensive weapon against growing competition from fintech companies which are intercepting lot of areas developed and traditionally occupied by banks.

The interest shown by banking sector in RPA can be seen in an examples of first intensive deployments of RPA in Polish banking sector – a cases of ING Bank Śląski[23], Alior Bank[24] and BZ WBK[25]. All case studies were collected at our *www.ronobomika.pl* Website.

ING Bank Śląski deploys RPA both in its front office and back office as a result of 10 years of in-house research and development of RPA. In Front Office since Q1 2018 the chatbot *My Assistant* helps users of internet and mobile banking. Internally, in its departments of operations the bank uses more than 1500 robots. In 2017 they were used approx. 600 thousand times, supporting 500 users in bank backoffice. The example of the use is parametrization of script automatically introducing changes to the whole banking systems after the client has signed an annex to his loan agreement. RPA is used to analyse excerpts from the Land and Mortgage Register and clients' files as well. Bank The bank is developing an RPA

[23] ING Bank Śląski is No 5 in ranking of the Polish bank sector (by balance sheet). 75% of its shares is owned by ING Groep N.V. from Netherland.

[24] No 8 in ranking in Poland. Established in Poland in 2008 by Italian investor C. Tassara than sold to other investors. In March 2018 approx. 32% of shares is owned by PZU Polish national insurance group, 14% by other insurance companies and 54% is a free-float at Warsaw Stock Exchange.

[25] No 3 in ranking in Poland. After privatization in 1995 and consecutive transactions approx. 70% of shares were owned by Iris group of Allied Irish Banks. In 2011 these shares were sold to Spanish Santader Group.

RoboPlatform as a part of its *End User Computing* platform supporting internal non-IT specialists in quick implementation of RPA solutions in their business areas.

Robotization and automation are one of the key elements of "Digital Rebel" [9] strategy of Alior Bank for 2017-2020. From deployment of RPA Alior Bank expects improving its C/I (Cost/Income ratio) from 49% (already best in Poland banking sector) down to 39% due to operational cost savings expected at a range of 20-30%. Its main in-house RPA development is *Dronn* virtual assistant, a solution combining AI, biometry and speech recognition. It has been integrated with statistical software and presentation tools. Dronn is supporting so called soft debt collection and marketing of bank services. In 2017 Dronn has been assisting 963 thousand debt collecting calls, 1.3 million calls in customers segmenting surveys and in collecting FATCA tax residency statements from 77 thousand customers.

Bank Zachodni WBK (BZ WBK) has initiated its in-house RPA development platform under the name of "Factory of Robots" developing robots for operational departments using virtual platforms, agile software development and scrum frameworks. First implementation was a consumer complaint robot, followed by supporting loan aftersales services and parametrisation of e-services for business customers.

In its „Digital Rebel" strategy Alior Bank indicates the potential of RPA deployment in main fields of bank activities. The biggest potential for deployment is seen at daily operations executing tasks of supplying the transaction data to various systems and supporting verification of criteria for loans. The second in the range are the fields of internal management (HR, accounting), support of Back Office at treasury, fraud detection and AML, customer notification and verification of their documents and preparation of operational reports. Despite successful deployment of Dronn the potential of sales support is seen as moderate in digital sales channels and very limited in the support of personnel at local (physical) branches.

4 RPA global market – hype and reality

It seems that business community is very excited about potential of growth of RPA market. The market is still in its onset phase: according to HfS the global market for RPA software and services reached USD 271 million in 2016 and USD 443 million in 2017 [10]. According to Market Research Future, the RPA market is expected to grow to the value of USD 2.7 billion by 2023 with a CAGR of 29% between 2017 and 2023 [11]. The Grand View Research is far more optimistic: in their opinion the global RPA market is expected to reach USD 8.75 billion by 2024 [12]. TMR Analysis predicts even higher pace – in their prognosis CAGR of

the global RPA market in the years 2016-2024 will exceed 47% [13]. The differences are due to assessment of progress and from different definitions of RPA market (some does not include wider operational services like BPO, which may include RPA becoming increasingly embedded in its delivery).

Today the value RPA brings to businesses today lies in the digitizing of basic, rudimentary and routine manual processes and everybody knows that the potential for automation of these processes will run out first. The real potential for the next stage lies in RPA software development toolkits that will allow non-IT specialist easily create bots (software robots) to automate rules-driven business processes.

In reality there are still some hindrances and impediments for massive introduction of RPA. One may call low maturity level of solutions, existence of services more difficult to automate (i.e. customer service activities), limited resources to design and deploy full automation at the integrators/suppliers, substantial implementation time in quickly changing and dynamic environment, lack of economy of scale, the reluctance of SMB sector (quite understandable having regard to the nature of SMBs), cultural and social factors, inertia of organizations.

C. Lambertone from EY Financial Services Insight in his "Get ready for Robotic Process Automation" [14] summarizes challenges of RPA deployments across 20 countries and underlines that as many as 30 to 50% of initial RPA projects fail due some common mistakes done by organizations during these deployments. It does not necessarily mean catastrophic failures, mostly not delivering on the promises or not meeting the expectations. It is worth to notice his interesting statement: "Any technology that can reduce the costs of existing manual operations by 25% to 40% or more without changing existing systems…" The author mentions top 10 issues:

1. not considering RPA as business-led, as opposed to IT led,
2. not having an RPA business case and postponing planning until after proof-of-concepts (POCs) or pilots,
3. underestimating what happens after processes have been automated,
4. treating robotics as a series of automations vs. an end to end change program,
5. targeting RPA at the wrong processes,
6. applying traditional delivery methodologies,
7. automating too much of a process or not optimizing for RPA,
8. forgetting about IT infrastructure,
9. assuming RPA is all that's needed to achieve a great ROI
10. assuming skills needed to create a PoC are good enough for production automations.

C. Lambertone emphasises that very often more than one of these issues is present or linked, creating a multiplier effect.

On a base of initial production deployments, extending beyond the POC (Proof of Concept) we compiled a list of impediments occurring in Poland today [15]:

1. High level of defragmentation of applications needed to executing given business process. In lot of companies analysed there is at least 4-5 (in some cases even more) applications needed for completion of process, most of them being legacy software;
2. High diversification of input data in its character (e-mail, electronic forms, faxes, scans of paper documents) and structure. The usual problem is that the structure of documents used in business processes was never designed having in mind using it in RPA environment;
3. Still very high share of input documents having the form of paper;
4. Low quality of data in registers and systems planned for robotization;
5. Low level of knowledge on the real trajectories of business processes to be robotized, most of this knowledge is neither defined nor described properly, especially in the cases of by-passes and shortcuts invented and used by employees of the company in the cases of (unreported) small issues and pitfalls;
6. Habit of supplying the final output in the paper form (sometimes imposed by faulty regulations);
7. IT tools being not enough user-friendly (or even difficult to use).

The interesting observation is that we have not met the hostile attitudes of personnel of companies introducing RPA ("the robot will steal my job"). Just opposite: quite common was the expectation of support by robots relieving employees from burdensome and dull tasks, especially in the usual situation of raising the production targets and quotas in today's general limitation of human and financial resources. Of course this attitudes may change in the timeframe of 3-4 years when RPA will really grab away their jobs.

5 The manpower vs business robots in Central and Eastern Europe

One of the success stories in delivering services abroad in Poland as well as other CEE countries are BPO services. In the ranking published as AT Kerney Global Services Location Index (GSLI 2017) out of 55 countries listed in its edition of 2017 [16] (and since the beginning of its publications in 2004 as Offshore

Location Attractiveness Index, since 2009 under today's title) not surprisingly No 1 is India. In the ranking there is a strong group of CEE economies: Poland is No 12, Bulgaria No 15, Czech Republic No 16, Romania No 18, Estonia No 25, Hungary No 26. Latvia, Lithuania and Slovakia are present too (No 28, 29, 44 accordingly). The highest number of BPO centres is in Poland – almost 1 thousand of them employing more than 200 thousand people working amongst the others for Accenture, Credit Suisse, Goldman Sachs, Zurich Insurance, and Cathay Pacific Airways. But as RPA gains impact, the cost of licences and deployment process decreases and businesses and suppliers are collecting expertise, the positions of CEE countries are in danger, especially as our advantage is mainly a financial attractiveness, as it can be seen at Figure 1.

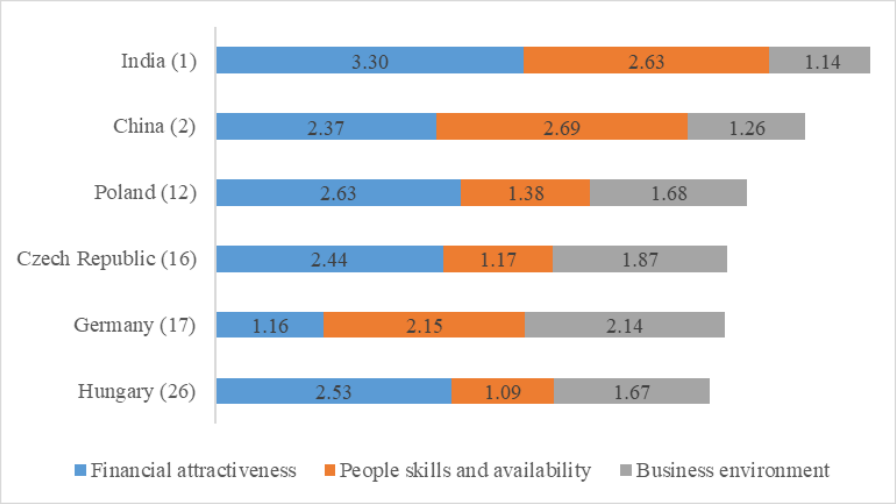

Figure 1. Positions and indexes of chosen countries in AT Kerney GSLI 2017 [16]

In the opinion expressed in the AT Kerney GSLI 2017 in 4 countries which are strong players on the BPO market – India, Philippines, Poland and USA – approx. 1 million jobs may be lost within 5 years as a result of RPA. The jobs in Mexico and Costa Rica strong players in BPO for Spanish-speaking world or Morocco and Tunisia for French speaking countries are threatened as well.

Conclusion

Today we may observe a kind of fashion for RPA but there are distinctive differences in the range of deployment amongst the business areas and industries. However it is non-disputable that RPA market will grow quickly in the near future – both in the development of software tools and deployment in services. A substantial interest in RPA shown by top BPO players can be easily understood considering that on one side the RPA endangers their position on global BPO

market, on other side it promises substantial savings in a cost of supplying BPO services and increase of productivity and efficiency.

From RPA the companies are expecting not only a possibility of reduction of operational costs – they see the potential of bringing additional business values as well.

Observing today's business trends we share the views expressed by a lot of analyst that robotization will destroy low paid, low skilled jobs shifting the labour market focus to the higher skilled workforce and higher-paid jobs. It stands for robotization of industry as well as of services. According to AT Kerney GLSI 2017 in the field of BPO only 1 automated job is created for every 4 lost due to automation[26]. Another view we share is that companies with labour-intensive processes and employees performing high-volume, highly transactional process functions, will boost their capabilities and save money and time with RPA. Such re-shoring – moving towards high-technology areas: design, maintenance, testing and calibration – may be a countermeasure for CEE countries which positions on BPO global market are threatened.

RPA may offer advantages to businesses suffering the shortage of labour as it can streamline the resource allocation. It is a question of cost of solutions (licences, ease of use of cloud solutions etc.) whether it will offer similar advantages to companies employing low number of people, i.e. SMBs.

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