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Bachelor Thesis

Introduction of Robotic Process Automation in shared business services centers

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Introduction of Robotic Process Automation in shared business services centers

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Objectives of thesis

The main objective of the thesis is to evaluate options for RPA implementation in a company using SAP ERP.

The partial goals of the thesis are:
- to make a comprehensive overview of approaches to products and barriers of implementing RPA in ERP;
- to conduct a case study for a company using SAP ERP;
- to evaluate possible RPA options and make recommendations.

Methodology

Literature review is conducted using methods of synthesis, induction, deduction and extraction. Analytical section is done with the use of multiple criteria decision analysis (MCDA) methods by interpretation of gained results. Based on the theoretical part and practical estimations, discussion and conclusion are provided.

The proposed extent of the thesis

30 – 40 pages

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RPA, ERP, information system, business process, SAP.

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Madakam, S., Holmukhe, R. M., & Jaiswal, D. K. (2019). The future digital work force: robotic process automation (RPA). JISTEM-Journal of Information Systems and Technology Management, 16.

Osman, C. C. (2019). Robotic Process Automation: Lessons Learned from Case Studies. Informatica Economica, 23(4).

Vom Brocke, J., Maaß, W., Buxmann, P., Maedche, A., Leimeister, J. M., & Pecht, G. (2018). Future work and enterprise systems. Business & Information Systems Engineering, 60(4), 357-366.

Willcocks, L., Lacity, M., & Craig, A. (2017) . Robotic process automation: strategic transformation lever for global business services?. Journal of Information Technology Teaching Cases, 7(1), 17-28.

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Declaration

I declare that I have worked on my bachelor thesis titled "Introduction of Robotic Process Automation in shared business services centers" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on date of submission _____

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Introduction of Robotic Process Automation in shared business services centers

Abstract

The bachelor's thesis aims to introduce Robotic process Automation in shared business services centers. The work is divided into three chapters – theoretical review, comparison of RPA tools and multiple criteria decision analyzing selected RPA from the user's perspective.

The first chapter explains that basic terms and concepts relevant to Artificial Intelligence and RPA tools gives the theoretical framework to multiple criteria decision-making analysis.

The second chapter compares the RPA tools based on criteria such a price, service and support, reliability, study the program and Evaluation and Contracting, etc.

The third chapter uses the multiple criteria decision-making analysis to compare selected RPA from the RPA global market.

The decision parameters are established, aspiration levels are formed, and possible options are listed.

Keywords: Artificial Intelligence, RPA, Automation, RPA benefits

Úvod Automatizace Robotických Procesů v centrech sdílených obchodních služeb

Abstrakt

Bakalářská práce má za cíl představit Automatizaci Robotických Procesů v centrech sdílených obchodních služeb.

Tato práce je rozděleno do tří kapitol: teoretický přehled, porovnání nástrojů RPA a rozhodnutí na základě více kritériích analyzující vybrané RPA z pohledu uživatele.

První kapitola vysvětluje, že základní pojmy a pravidla spolu s pojmy související s nástroji umělé inteligence a RPA poskytují teoretický rámec pro analýzu rozhodování na základě více kritérií.

Druhá kapitola porovnává nástroje RPA na základě kritérií, jako je cena, výhoda a spolehlivost, spolehlivost, studium, výhoda a ochrana atd.

Třetí kapitola využívá analýzu rozhodování na základě více kritérií k porovnání vybraných RPA z globálního trhu RPA.

Jsou stanoveny parametry rozhodování, jsou vytvořeny úrovně aspirace a jsou uvedeny možné varianty.

Klíčová slova: Artificial Intelligence, RPA, Automation, Výhody RPA

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1 Introduction

The emergence of the ‘Robotic Process Automation’ term began around early 2000. The term Robotic Process Automation (RPA) though sounds like a physical robot that runs human operations, in fact, it is a computer software configuration that replaces humans in doing a task (Willcocks, Lacity & Craig 2015). Bataller, Jacquot, Torres (2017) defines RPA as a method, system, and tool, including computer programs coded into computer storage, to automate manual processes. Method, system, and tool include measures to identify processes manually executed by users who interact with computers and automate the process by a robot that is configured to interact with other computers.

This thesis reveals RPA implementation and the important keys to how to choose the right RPA tool. The first part introduces what is Artificial intelligence, how nowadays business process move to automation by bots and explain what RPA is.

The second part analyze the most popular RPA tools in market and explain their differences.

The third part regarding MCDA analysis will provide specific information, based on criteria, which are took from several source, to help make a decision.

2 Objectives and Methodology

2.1 Objectives

The main objective of the thesis is to evaluate options for RPA implementation in a company using SAP ERP.

The partial goals of the thesis are:

a) The comparative analysis of RPA approaches
b) Using and applying the multiple criteria decision analysis among RPA candidates
c) Make observation of case study for a company using SAP ERP

2.2 Methodology

Literature review is conducted using methods of synthesis, induction, deduction and extraction. Analytical section is done with the use of multiple criteria decision analysis (MCDA) methods by interpretation of gained results. Based on the theoretical part and practical estimations, discussion and conclusion are provided.

3 Literature Review

3.1 Artificial Intelligence

The effect of IT technology, especially Artificial Intelligence (AI), on the future of work progresses along an axis of optimization, automation, and disruption innovation. Artificial intelligence (AI) technology has advanced at a breakneck pace in recent years, generating a lot of excitement about the implications for the future of jobs. (Brynjolfsson and McAfee ,2014) Technological unemployment can be interpreted as a positive, long-term human action: “Technical productivity is increasing at a greater rate than we can cope with the challenge of labor absorption.” (Vom Brocke et al, 2018).

At its inception, Artificial Intelligence has dealt on empirical and mathematical fact principles (Russell and Norvig 2009). Artificial neural networks (ANN) and mathematical learning were investigated in the 1960s but fell out of favor in the late 1990s due to inefficiency and scalability issues (Schmidhuber 2015). Semantic methods, on the other hand, have been used for a long time and have had a lot of results, such as in speech recognition. In Germany, the landscape of various artificial intelligence technologies has grown over decades and is now gaining mainstream adoption in a number of industries. The availability of reliable infrastructures and the rapid creation of stable and scalable algorithms are also critical. Technologies such as supervised and non-supervised learning, as well as different variants of deep learning and reinforcement learning, are important vehicles.

Artificial intelligence (AI) is currently popular in controlled settings, such as sports, such as Go. AI systems allow autonomous activities, such as autonomous driving, at the intersection of research and implementation. The same is true of workplaces where humans and robots work together. Robotic Process Automation (RPA) incorporates artificial intelligence (AI) into enterprise processes to improve decision-making intelligence, responsiveness, and adaptability. Today, ANNs build "black boxes" that bury decision-making information in the depths of mathematical networks, partly delegated to foreign operators so that businesses no longer have control over their own data and knowledge. As a result, decisions are difficult to justify or comprehend, raising a slew of strategic and legal issues.

3.2 AI and automation

A substantial majority of new AI ventures concentrate on enhancing internal market processes. Projects using chat bots to boost customer interaction in call centers are exceptional. Predictive maintenance programs, which are commonly listed, are often aimed at lowering maintenance costs. In the area of transition, there are significantly less operations. Above everything, Industry 4.0 is a transformative method that transforms mass manufacturing into individual production (Kagermann et al. 2013). As a result, Industry 4.0 is characterized as the provision of individual product service systems at mass production's marginal costs. Multinational companies' Internet of Things (IoT) platforms are an example of disruptive transformation programs. These businesses begin to test innovative business models with unforeseeable ramifications on existing business models as a result of AI-based transformation initiatives. These efforts are frequently inspired by

the reality that conventional product profit margins are declining, and that only smart services can offer growth opportunities.
Naturally, in the area of disruption, there are even fewer examples. Uber's self-driving cars are creating mayhem in the global mobility market. AI tools for matching passengers and Uber taxis, competitive pricing, and ease-of-use are crucial for disruption, as Cramer and Krueger (2016) demonstrate.

3.3 Transformation on work and business models

Transformation and instability are consequences of AI-based developments on the future of direct and indirect function along the transformational axis of optimization. In the field of optimization, there are direct impacts on current jobs. In call centers, chat bots are used to either improve customer service or cut costs. Call center agents in the first case offer higher-value resources, while in the second case, workforce losses exist. As a result, the overlapping priorities of quality and cost efficiency will guide the future of job optimization.

Direct results are classified into two groups in terms of transformation. In the one side, new jobs are created as a result of transformational business model developments, such as the production and operation of IoT platforms and services. There would be detrimental effects on employment as they obstruct the reduction or even abandonment of current market structures and associated goods and services. However, according to vom Brocke et al (2018), the majority of these advances are powered by market forces rather than AI-based services. As a result, the transition creates a trade-off between existing and innovative market models. A disruption has a direct, immediate effect. Wherever Uber or Lyft run, taxi firms are under a lot of scrutiny. Many cab firms would flee the market if the taxi business did not improve drastically.

Indirect impacts on work in the field of optimization are less possible, since they are more local in nature, according to recent developments. The improvement of manufacturing processes by predictive maintenance, for example, has little effect on sales organizations. For change, the case is new. Changes in current market models are often triggered by the introduction of new product service systems. When goods and facilities are abandoned, job losses and transfers to other fields arise. Since such developments affect any aspect of a company, early planning and implementation of adaptation steps is essential. It's impossible to predict the indirect consequences of disturbances, which contributes to a lot of reactive adaptation. The effect of autonomous vehicles on the automobile industry, for example, is difficult to predict. (Vom Brocke, Jan, et al ,2018).

How will businesses and sectors react to the effects of AI? As previously mentioned, the use of AI technology in optimization is mostly local in nature, with little indirect effects. It is possible to use traditional retraining methods. Transformation, on the other hand, often results in significant overt and indirect improvements in job organization. When businesses and whole sectors are reluctant to adopt transition, strategies backed by the introduction of new career profiles and significant investment in professional growth, major tensions are likely to occur. Statistical analysis of data sources, for example, allows organizations to respond rapidly to consumer demands. This necessitates restructuring efforts around the board, including marketing, distribution, human resources, and general management. As a result, it's critical to refocus organizational strategies, prepare

employees to satisfy evolving demands, reorganize corporate structures, and transform product and service offerings. (Vom Brocke, Jan, et al ,2018).

Robotic Process Automation has a broad variety of applications in sectors such as healthcare and pharmaceuticals, financial services, outsourcing, banking, telecommunications, electricity and infrastructure, real estate, and FMCG (Fast Moving Consumer Goods), among others. Furthermore, some of the business functions that Robotic Process Automation systems can conduct include data cleaning, order control, claims handling, payment processing, direct debit, regulatory report drafting, underwriting in banking, and automated marketing programs through finance, compliance, treasury, and marketing. As a result, Robotic Process Automatic systems are creating new job profiles such as transcribers, financial analysts, cab drivers, home automation, senior citizen support, and patient care, among others. (Madakam.S et al, 2019)

If we look at one of the leaders in Robotic Products technologies, they provide a wide variety of services, including on-premise or cloud-based solutions, managed service capabilities, qualified professionals to assist in automation, process consultancy experience, non-disruptive solutions, no system replacement needed, no software creation or system integration, dramatically enhances speed and performance, and significantly lowers costs. Some of the RPA technologies developed and tested by M/s. Infosys, an Indian-based firm, include Infosys BPM, which reimagines business process management and provides an advanced business process service stack by blending automation and artificial intelligence. One that has been shaped to maturity in several customer settings after thousands of hours of studying and research. (Madakam.S et al, 2019)

There are some of the robotic process automation devices and technologies provided by multinational corporations. Many other firms, including new start-ups, have set out to plan, develop, and introduce RPA technologies. However, other allied technology, such as artificial intelligence, machine learning, deep learning, data analytics, HR analytics, virtual reality (second life), home automation, blockchain innovations, and 4D printing, are operating in the background to position RPA in the right spot in business operations. (Madakam.S et al, 2019)

3.4 Robotic Process Automation

“Robotic Process Automation is the next wave of innovation, which will change outsourcing. We already are seeing the beginnings of a race to become the top automation-enabled service provider in the industry. In time, we are likely to see an arms-race for innovation in automation tools leading to new offerings and delivery models”.

Sarah Burnett, Vice President of Research at the Everest Group

Although the word "Robotic Process Automation" conjures up pictures of physical robots roaming around workplaces conducting human activities, the term specifically refers to the automation of previously human-performed service tasks (Madakam.S et al, 2019). RPA more often refers to configuring machines to execute functions traditionally undertaken by humans, such as moving data from various input channels, such as email and spreadsheets, to systems of record, such as Enterprise Resource Planning (ERP) and Customer

Relationship Management (CRM) systems. The Robotic automation is the application of specific technology and methodologies to use a computer or "virtualized FTE or robot" rather than a person to manipulate existing application software Enterprise Resource Planning's, claims applications, databases, learning management systems in the same way that a person today processes a transaction or completes a process. Robotic process automation uses in back offices and joint business processes, as well as across BPO service providers, increased dramatically in 2016. The use of robotic process automation (RPA) has progressed from pilot projects to widespread acceptance. The Pronexus Interactive Voice Response (IVR) implementation toolkit delivers basic information to consumers when linking them to the appropriate call center executive based on their needs.

RPA is a cover expression for tools that run on other computer systems' user interfaces in the same manner that a person does. RPA seeks to replace humans by automating processes from the outside in. This contrasts with the traditional "inside-out" approach to information technology improvement. The information system remains unchanged, unlike conventional workflow technology. "RPA tools execute [if, then, else] statements on structured files, usually using a mix of user interface interactions, or by linking to APIs to drive client servers, mainframes, or HTML code," according to Gartner. An RPA tool works by mapping a process for the program robot to adopt in the RPA tool language, with runtime allocated by a control dashboard to execute the script." Tornbohm (Tornbohm, 2017). As a result, RPA resources are designed to relieve workers of the pressure of doing routine, basic activities (Aguirre and Rodriguez 2017).

RPA is a mechanism of automating processes that falls into a wide category of process automation systems, each of which is tailored to specific processes and goals (Willcocks et al. 2015b). RPA acts as a transition factor between human work and comprehensive business process automation in circumstances where human labour or the construction and deployment of business process management systems (BPMS) are too costly or not warranted by business needs (Lu et al. 2018). (Van der Aalst et al. 2018). As a result, so-called software robots gain access to structures and execute functions that are analogous to or imitate those of humans (Lacity et al. 2015; Moffitt et al. 2018; Van der Aalst et al. 2018). Use of RPA to automate procedures may also refer to the automation of human operations or even tasks. For eg, a software robot could start a new instance of Microsoft Excel, navigate to a specific spreadsheet, adjust values in specific cells, and save the spreadsheet before closing the application. In comparison to RPA automation processes in a more or less unattended manner, robotic desktop automation (RDA) relies on human participation in activities such as front office functions (Evans 2017; Seasongood 2016). However, RPA and RDA do not adopt entirely separate principles or goals.

3.5 Products for RPA

Robotic Process Automation (RPA) is the automation of repeatable and rule-based activities using non-invasive software called BOT that can simulate behaviour performed by human users on machines to complete different business processes. Though its word is "Robotic Process Automation" means the physical robots wandering around workplaces executing human activities, RPA is a software-based solution. A robot personal assistant (RPA) is a software program that automates repetitive tasks "One software license is equal to "robot." In the so-called Hype Cycle, RPA resources are at the ''peak of inflated

standards," according to Gartner. For the past 10-15 years, software applications for automatic regression testing and automated performance tracking using simulated users from various locations have been available. These tools may imitate human staff and perform tasks like regression checking and debugging of different front-end desktop and web applications in a consistent manner. RPA is a logical extension of these capabilities. Automation Edge, Automation Anywhere, Blue Prism, Cognizant, Conduent, Kofax, Kryon Systems, Pegasystems, Softomotive, and UiPath are only a few of the vendors that sell RPA software. Physical robots have been increasingly replacing blue-collar factory workers, and virtual robots will be replacing a large proportion of white-collar jobs in the near future. As a result, the Robotic Process Automation professional must be familiar with RPA program implementation, structure, control flow (Decisions, Loops, Switches), error management with Try/Catch, automating excel, term, and Compact Paper File interactions, automating email and attachments, decomposing a process into interchangeable sub-components, and debugging abilities, among other items. Outside of routine operations, Robotics can produce high-quality answers to more nuanced questions. Artificial intelligence (AI) techniques allow machines to ingest vast quantities of data on a wide range of topics—far more than any person might. (Madakam.S et al, 2019).

3.5.1 Blue Prism

The word "Robotic Process Automation" was introduced by M/s. Blue Prism®, a company founded by David Moss and Alastair Bathgate in the United Kingdom. With new v6 features and integrations, the Blue Prism provides an intelligent, integrated, and simple-to-use digital workforce. RPA is the use of algorithms to simplify functions that were traditionally performed by humans. Since it substitutes human resources, software is known as a robot. RPA, once combined with artificial intelligence, will aid in the processing of unstructured data in support of anti-fraud and anti-money laundering efforts (AML). The use of Blue Prisms digital labor is enabling companies like Shop Direct, Co-operative Banking Group, Fidelity Investments, RWE npower, the NHS, and O2 to quickly adapt to market change through agile back-office operations. To streamline corporate processes and cut prices, more CIOs are moving to RPA, a new technology. Experts agree that by using RPA, companies can simplify routine rule-based business procedures, freeing up employees to focus on higher-value tasks like servicing clients. Computer robots are being used to automate routine, rule-based operation operations, resulting in increased efficiency. Such automation, if properly applied, will result in high-performing human-robot teams, in which software robots and human workers supplement each other. (Madakam.S et al, 2019).

3.5.2 UiPath

M/s UiPath is at the top of the development digital market movement, facilitating the accelerated introduction of software robots that enhance business efficiency, compliance, and customer experience in both back-office and front-office operations. Robotic Process Automation systems, according to UiPath, log into programs, transfer files and folders, copy and paste data, fill in forms, retrieve structured and semi-structured data from records, scrape browsers, and many other items. As of March 6, 2018, Accel, CapitalG, and Kleiner Perkins Caufield & Byers had invested $153 million in UiPath, valuing the firm at $1.1 billion.

3.5.3 Automation Anywhere

M/s. Automation Anywhere is a cognitive robotic process automation application that can automate any industrial enterprise business process. The Automation Everywhere Bot Store from Automation Everywhere helps companies to scale up their automated workforce more rapidly than ever before. This increases human worker productivity and encourages them to spend on more human-centric projects. For over a decade, M/s. Automation Everywhere has provided leading healthcare, financial services, telecommunications, engineering, and insurance companies with the world's finest Robotic Process Automation and cognitive technology. (Madakam.S et al, 2019).

3.5.4 Kofax

M/s. Kofax Inc. (Kofax) was founded by David Silver and Dean Hough in 1985. It is a tech firm that specializes in process automation with headquarters in Irvine, California. Kofax's method extracts and classifies data from paper and digital media, and transfers it to the relevant business units, resulting in smooth data collection and less human interference and error. Kofax integrated Document Workflow, Imaging, Intelligent Capture, and Business Process Management as demand for single platform devices and mobile applications grew. (Madakam.S et al, 2019).

3.5.5 O2

M/s. "O2" is a telephone firm based in the United Kingdom (UK). With over 25 million clients and over 450 retail outlets and supporters, it is one of the UK's largest digital communications companies. O2 operates 2G, 3G, and 4G networks throughout the United Kingdom, as well as controlling half of Tesco Mobile and running O2 Wireless Fieldality (Wi-Fi). As of March 31, 2015, O2 has replaced 150 employees with a single piece of automated software over the three-year period from 2012 to 2015. Mr. Wayne Butterfield, an O2 operations manager, confirmed that a significant majority of the company's customer support is now automated. He went on to say, "Sim switches, cell number porting, switching from prepaid to contract, and unlocking an O2 phone." This is an excellent real-time RPA program. Since 2015, Cap Gemini's in-house robots have handled 1,5 million transactions, equating to 200 workers "The hardware used is less important than the process architecture when it comes to ROI.". A bank's experience with RPA technology, according to David Schatsky, a managing director at Deloitte LLP, was that the bank redesigned its claims mechanism by installing 85 bots to operate 13 systems, processing 1.5 million requests per year. The bank added capacity equal to more than 200 full-time workers for less than a third of the expense of hiring new employees (Clint Boulton,2018). AT&T, Walmart, Deutsche Bank, Ernst & Young, Vanguard, Walgreens, Anthem, and American Express Global Business Travel are among the many companies that have adopted RPA technology, according to the author.

A client requested about the prospects for the Chinese stock market, and a "The "chatbot" should have compiled all of the related data and responded that the Chinese stock market was expected to grow. In reality, digital rivals are rapidly putting pressure on financial advisors ""Robo-advisors" is a term used to describe automated advisors.

3.5.6 Laserfiche

According to Brandon Buccowich(2016) from M/s. Laserfiche, Robotic Process Automation technology has a lot of benefits, including increased accuracy, improved staff performance, increased competitiveness, lowered technological hurdles, security, quality, and reliability, as well as non-invasive technologies. The beauty of robot process automation is that non-technical workers would be able to customize their own software robots to overcome their automation problems. Payroll, job position updates, new hire recruiting and onboarding, accounts receivable and payable, invoice collection, inventory tracking, report formation, program installations, data transfer, and vendor onboarding, to name a couple, will all benefit from RPA.

RPA does not imply that a physical robot can take the place of a human. It's a digital solution that's programmed to mimic existing procedures that were historically introduced and monitored by humans. RPA is a concept that is used to describe the entire automation life-cycle operation, and it typically consists of 1. RPA robot—a single software component that is programmed to perform a particular task. 2. RPA management software—this is the application that monitors and guides all of the RPA robots. 3. RPA development tools—software modules that allow an RPA developer to plan, build, test, schedule, and execute RPA robots. (Madakam.S et al, 2019).

3.6 Benefits of RPA

According to Gartner report, processes streamlined with RPA save time for rework of incorrectly completed work and reduce inconvenience to other staff members due to the dynamic change management performed within the team during typical business process automation. Additionally, automating routine processes frees up time for the team to work on more challenging and difficult-to-automate aspects of the process. (S. Jovanovi et al., 2018)

According to ProV Consultancy, robotic process automation saves businesses about 30% of their time and increases customer service by freeing up scarce energy for consumers to be on the front lines. The reduction of organizational risk is also a significant advantage because it reduces the risk of conducting the procedure incorrectly or without information. Procedure concept is an important aspect of RPA since procedures must be established before they can be automated, allowing for improved process governance. Finally, and perhaps most importantly, RPA integrates with existing IT networks, eliminating the need for substitutes, since RPA robots use IT infrastructure in the same manner as humans do. (S. Jovanovi et al., 2018)

The fact that robotics can run 24/7, replacing the work of 1.7 humans (Slaby, 2012), reducing entry costs to 70% (Anagnoste, 2017), and therefore making FTE savings is one of the greatest benefits and the reason why businesses are beginning to use this technology heavily (Lacity and Willcocks, 2015; Suri et al., 2017; Tran and Ho Tran Minh, 2018). By replacing humans with robotics to perform routine activities, employees are able to concentrate on more critical tasks such as problem solving and exception management,

resulting in increased workplace satisfaction and employee retention (Slaby, 2012). It can also help to build new work, such as robot management, consultancy, and advanced data analytics (Asatiani and Penttinen, 2016), as well as minimize reliance on offshore FTEs by allowing new FTEs to be hired (Slaby, 2012). To illustrate this, a $30000 offshore FTE can be replaced by a robot that costs $15000. (Slaby, 2012). Robots produce less mistakes and work quicker and more reliably than humans, resulting in better efficiency (Alberth and Mattern, 2017) and a faster return on investment (ROI) (Lacity and Willcocks, 2017; Suri et al., 2017). Customers are more impressed with the work performed by robotics, which increases customer experience. Robots can work with other applications when they communicate with the device user interface, regardless of whether or not it is open to third-party integration (Asatiani and Penttinen, 2016). The applications are not updated, and the robot communicates with the user interface, resulting in improved security (Suri et al., 2017). This means they will roll out new features earlier than other IT solutions that use APIs to interface with applications, taking 2-4 weeks instead of months or years (Asatiani and Penttinen, 2016). Robots can also respond to service demand by being flexible and resizing easily without having to spend a lot of capital in production (Tran and Ho Tran Minh, 2018). They can also repurpose parts to help simplify other activities (Slaby, 2012).

3.7 Drawbacks of RPA

The literature does not just mention advantages. It also highlights several RPA drawbacks that businesses must consider when implementing RPA to simplify processes. One of the major drawbacks of RPA is that it is only suitable for rule-based operations, since it is carried out by a robot of limited cognitive abilities that relies on rules to complete its tasks. When the procedure has a number of exceptions, it must be turned over to staff, which adds to the difficulty of the process since the computer and the person must be coordinated in order to perform the tasks in a timely and error-free way. (Santos, F. et al, 2019)

Since robotics must be monitored, new tasks will be generated for staff to track the robot to ensuring that the execution results are right, allowing them to spend their time on tasks that add more benefit. RPA may be a temporary workaround for automating processes built on existing systems, but it could be more cost-effective in the long run to scrap the legacy system and create a new one. (Asatiani and Penttinen,2016).

3.8 Overview of RPA solutions

	Blue prism	UIPATH	Anywhere	SAP Intelligent
Typical use cases	to meet the IT requirements of the company in terms of security, scalability, auditability and	-	-	-

	change management			
Industries	BFSI, health, and pharmaceuticals, retail and consumer, telecom and media, manufacturing, public sector, travel, and transportation	BFSI, healthcare, telecom and media, and retail	The Banking, Financial services, and Insurance (BFSI) accounts for more than half of its revenue, followed by healthcare, telecom, media, and others	banking, insurance, telecom, utilities, and the public sector (including local governments)
Development tools	Automation of software developed in Java or Webbased and Windows Applications	- Technology based on Microsoft .NET	Technology based on Microsoft platform	Automation with prebuilt bots for SAP software
Interesting facts,	founded in 2001 headquartered in United Kingdom has strong presence in the market with lot of clients using their robotic software solutions	UiPath was founded in 2005 but they received seed funding in 2015 and in 2018 they are valued at 1.1 billion after round of funding from known investors Accel, CapitalG, and Kleiner Perkins Caufield & Byers.	Automation Anywhere leads the industry with a web-based, cloud-native RPA platform that's SOC 2 Type 1 certified	Based on Contextor SAS
Pricing and license policy	By request	Studio License (Annual): $2000 – $3,000	By request	By request

Table 1 Short description of RPA

Robotic Process vs Traditional Process Automation

Traditional process automation is referred to as Business Process Automation because it is an unavoidable feature of Business Process Management (BPM) (BPA). The primary goal of conventional automation (BPA) is to optimize operations by streamlining them and eliminating inefficiencies. As a result, this strategy is focused on developing or improving frameworks and processes to improve performance. RPA, on the other hand, is based on allowing a robotic workforce to complete all of the time-consuming, routine activities. RPA does not attempt to simplify the process; rather, it aims to speed it up by using virtual robotics rather than human operators to execute process operations. RPA is a short-term tactical measure that can be used before a conventional automation project can be designed and executed. RPA is non-disruptive and nearly agnostic to the systems that underpin it. (Jovanović, S et al, 2018)

Traditional business process automation (BPA) is a strategic information system change step that identifies all areas where current operations can be streamlined by greater system alignment or the implementation of advanced process tools. RPA does not require advanced programming abilities to execute because it can be run on a server or on a user's desktop and automates activities at the User Interface stage. BPM suites (BPMS), enterprise resource planning (ERP) systems, application programming interfaces (APIs), service-oriented architecture (SOA) as a key foundation of an IT infrastructure, integration platforms, and/or advanced workflow applications are examples of conventional business process automation technologies. Applications are integrated at three levels: API/services, database, and infrastructure. BPA integration necessitates much more specialized programming abilities than RPA. Traditional process automation encompasses a wide range of technologies, including workflow automation software, advanced process software, organized and unstructured data, and dynamic interfaces. (Jovanović, S et al, 2018)

RPA, on the other hand, is not a nice choice for systems that work with unstructured data, are dependent on complicated programming instructions, or have a high rate of exceptions. Only scenario-based activities are handled by RPA. Traditional automation is often associated with drawbacks such as higher installation costs and length, deployment sophistication, integration solution capability, and legacy device limitations. RPA, on the other hand, is non-intrusive and does not entail modifications to current applications; it is also easier to deploy and has lower average project costs than conventional automation projects. When it comes to the effect on the company, RPA is laid on top of existing applications; it does not require comprehensive employee training, so simple demonstration videos will suffice. Automation in the conventional context is destructive. It is spearheaded by IT professionals and necessitates extensive change management and employee preparation. (Jovanović, S et al, 2018)

3.9 Applicability of Robotic Process Automation

As previously mentioned, robotic process automation robots are programmed to execute routine tasks; thus, not all processes are ideal for this type of automation. Below are the

standard parameters for processes that are relevant for RPA, according to Fung.H.G (2014):

- Low cognitive specifications: RPA is better suited to processes with a lot of simple tasks, while complex processes with a lot of new, dynamic tasks are more challenging (or impossible) to manage.
- No need for access to different systems: RPA works on top of existing programs, but it mostly automates processes or activities within a single program or information system.
- High volume: RPA can be used to automate operations and functions that are performed on a regular basis.
- High risk of human error: procedures and functions that are usually conducted by operators and where the risk of human error is high (as shown by historical data records) should be prioritized when considering RPA implementation.
- Systems with minimal exception management: RPA applications can be used to simplify processes that don't have a lot of choices for handling those exceptions. (Jovanović, S et al, 2018)

3.10 Developing environments for Robotic Process Automation

In the last few years, several development environments have been available to facilitate the introduction of RPA. According to FORRESTER research conducted in the second quarter of 2018, UiPath, Blue Prisma and Automation Anywhere are the industry leaders. Each one of them has advantages and disadvantages. According to this report, the UiPath is a leading figure with shared resources and ease of robot design. On the other hand, Automation Anywhere is defined as an RPA tool providing an enterprise-grade digital workforce interface, while Contextor focuses on agility. (Jovanović, S et al, 2018)

3.10.1 UiPath

UiPath is an RPA application provider that develops and provides applications that aims to optimize businesses. The RPA platform consists of three components:

1. UiPath Studio to design the processes
2. UiPath Robot to automate tasks designed in UiPath Studio
3. UiPath Orchestrator to run and manage the processes:

• HQ: Bucharest, Romania
• CEO: Daniel Dines
• Key Clients: Atos, AXA, BBC, Capgemini, CenturyLink, Cognizant, Middlesea, OpusCapita,
• Source of income by region: North America, Continental Europe, United Kingdom, and APAC
• Source of income by industry: BFSI, hospitals, telecommunications and media, and retail; According to Forrester Report, UiPath is an industry leader. The key features of the UiPath environment are:

The key features of the UiPath environment are: - Intelligent planning and implementation. - Microsoft.NET-based application.
- Several applications are supported.
- Characteristics in web and desktop apps. (Jovanovic et al, 2018)

3.10.2 Automation Anywhere

Automation Everywhere assists businesses with automating their operations. RPA, conceptual data (machine learning and natural language processing), and business analytics are their key areas of emphasis. They can manage both organized and unstructured data with their buts. The system is made up of three major parts:

1. The Development Client to Build a Brit
2. A runtime environment in which a hotspot can be deployed.
3. A unified command center for monitoring and assessing various hots:

• HQ: San Jose, California, USA
• Est: 2003
• CEO: Mihir Shukla
• Some key clients: Deloitte, Accenture, AT&T, GM, J P Morgan Chase
• Monetization strategies by region: The United States generates more than half of the company's revenue, led by APAC, the United Kingdom, and continental Europe.
• Monetization strategies by industry: Banking, financial services, and insurance (BFSI) generate more than half of the company's sales, followed by healthcare, telecommunications, publishing, and other sectors.

The following are the key features of Automation Anywhere's RPA production environment:
- Computer learning-based emergent cognitive functions to simplify dynamic tasks; - Multi-tenancy.
- Commands for optical character recognition (OCR).
- Microsoft platform-based technology. (Jovanovic et al, 2018)

3.10.3 Blue Prism

Blue Prism seeks to offer automation that companies can adapt to their unique requirements. Blue Prism strives to do this by delivering modular, configurable, and centrally controlled automation. Accenture, Capgemini, Deloitte, Digital Workforce Nordic, HPE, HCL, IBM, TCS, Tech Mahindra, Thoughtonomy, and Wipro are among the companies that sell the apps.
• HQ: United Kingdom
• Est: 2001
• CEO: Alastair Bathgate
• Key Clients: BNY Mellon, RWE npower, and Telefonica 02
• Revenue by region: The United Kingdom accounts for more than half of the company's revenue, followed by North America, Continental Europe, and Asia Pacific.
• BFSI, health and pharmaceuticals, retail and consumer, communications and world wide web, manufacturing, public sector, travel and transportation are some of the industries that generate revenue.

The following characteristics can be observed in Blue Prism's evolving environment:

- A digital workforce of software robots can be managed securely, flexible, and centrally.
- Automation of document types like Excel, XML, csv, pdf, image.
- Automation of software developed in Java or Webbased and Windows Applications. (Jovanovic et al, 2018)

3.10.4 Contextor

Contextor can be used in the back or front office, like point-of-sale and branch-office scenarios, but it's best for "attended" activities. The robot is built on a basic representation of a human's desktop. The design process starts with simple initialization of robot stages, but the designer is often thrown into Java scripting to finish a macro. Complex programs that require Java support, NodeJS plug-ins, or FTP libraries may benefit from this approach. A good unified vision of an implementation is presented by the Galaxy control tower. In terms of analytics, end-to-end workflow capability, and desktop features like remote recording and capturing, Contextor outperforms the competition. The control tower's capacity will be enhanced by improved reporting and more complete job delivery, such as scheduling. It's best for experienced businesses or integration partners that want to add value by exploiting the versatility. (Le Clair, Craig et al, 2017)

4 Practical Part

RQ1: Which RPA is optimal for implementation in a large company using SAP ERP?

The first research question is aimed to find out the optimal RPA for a large company using SAP ERP. It will be based on MCDA method, which going to make clear choice of optimal RPA for company. The general criteria such a price, service and support, reliability, study the program and Evaluation and Contracting will help to determine the fittest RPA. After ranking, we can make decision, which RPA is relevant for implementing.

RQ2: What are the benefits of RPA from users' perspective.

The second research question will be based on comparison between RPA and will aim to identify how RPA can improve the business process and make easy to work with routine tasks, which give opportunities for employees to focus on more major tasks of company, make better services in relation with customers, keep their time and energy. Based on it, we can in fact, find out the most useful RPA, which will respond to request of companies and their wishes.

4.1 Case study of RPA implementation

4.1.1 Survey

For the case study the author took one of the branches of SAP company, which is based in Prague, Czech Republic. SAP is a developed software package that provides key business applications and was developed and promoted in Germany. SAP software became more well-known outside of Germany in the 1990s, capturing a significant share of the distributed package market in medium and large businesses all over the world. (Martin, I., & Cheung, Y, 2000).

As an employee in financial department, in team O2I (order to invoice), The author strongly believes, that RPA need to be exist in workflow. The company has a lot of routine process, which can be done with one bot, to make focus on more major part of work. Before each quarter, the author's team have meeting, where discuss about process, which can be improve. On last briefing, talked about invoice automation. The survey was administered to 20 employees (Including one IT specialist, Expert of Cloud from Argentina and two head managers of financial department, they were asked about RPA, it's features and their relation about it. All responsible, by end of survey, were positively reacted regarding SAP IRPA), at the beginning of first quarter 2021, who has different region

around the world. As it is our main goal; check the orders and issue invoices, we came to optimize the workflow. It was agreed by head manager and to make it come true, the author's team got the tasks to fix all issues, which can be challenge for future environment. The author's team already started the process with the biggest region such a Russia. Now, if some time ago, invoicing could be taking the whole month or even more, it can be done by one day.

So now, 1 employee can take not only 1 region, but already couple of them. It is really saving the time and make it better and faster.

4.1.2 RPA options - multicriteria analysis

Developers need facts (or results) to make decisions and need to aggregate the data to arrive at a final score for each candidate decision option (e.g. combining food prices and service of restaurants to recommend). Multi-Criteria Decision Management (MCDM) approaches are used to rank and assign a set of choices that best follow a set of criteria. Criteria are a group of parameters or qualities that must be achieved by a number of different options. Each criterion may be calculated in a number of units, such as degrees, kilograms, or meters, but they must all be normalized to achieve dimensionless classifications, i.e., a standard numeric range/scale, so that they can be added up to provide a final ranking. As a consequence, data normalization is an important aspect of the decision-making process since it turns the input data into numerical and equivalent data that can be graded and ranked using MCDM methods.(Vafaei, N et al, 2016).

The Analytic Hierarchy Process (AHP) was introduced by Saaty (1977,1980) helping to solve unstructured economic, social and management problems. AHP was used for a wide variety of problems from basic (e.g. school selection) to difficult ones (e.g. in allocating budgets and energy domains). The decision maker can organize the decision issue and split it into a hierarchical top down framework while using the AHP approach. Then he or she uses a scale to conduct a pairwise matrix analysis of parameters. (corresponding to semantic interpretations such has "A is much more important than B" regarding a criterion). The priorities are calculated using either Eigen vectors or a simplified version with weighted sum after normalization (SAW) (Gaudenzi, B et al, 2006) (Zahedi,F, 1986)

4.1.3 Normalization

Depending on the research domain, there are many meanings for data normalization. Data normalization, for example, is a method in which data attributes within a data model are arranged in tables to enhance the cohesion and reliability of data management. Depending on the situation or research domain, there are a number of other meanings. The author focuses on MCDM normalization processes in this article. (Vafaei, N et al, 2016).

In general, normalization in MCDM is a transformation method that uses a standard scale to extract numerical and comparable input data. (Vafaei, N et al, 2016). Following the

compilation of input data, some pre-processing is needed to ensure that the criteria are equal, making the data usable for decision modelling.

Several research on the impact of normalization strategies on the rating of alternatives in MCDM problems have shown that certain techniques are more suited to some decision processes than others. Chakraborty and Yeh (Etzkorn, B, 2015) analyzed four normalization methods (vector, linear max-min, linear max and linear sum) in the MCDM simple additive weight (SAW) method. They used a ranking consistency index (RCI) and the average deviation for each normalization technique was measured, and the vector normalization technique was found to be the best for SAW.

4.1.4 Experimental Study with RPA tools Example

This illustrative case consists of 5 criteria(C1,C2,..C5), which correspond to price, service and support, reliability, study the program and Evaluation and Contracting, and 4 alternatives (A1, A2, …, A4), which correspond to candidate RPA tools. Finding the best RPA for company is the goal; C1 is cost criteria, where low values are better, and rest of them are benefit criterion, where high values are desirable.

The issue is the use of linguistic term, we don't express price and another criteria of RPA in some unit we say it's very high or it is excellent well we can solve or resolve this issue by using a conversion scale here author used a five-point scale in which very low corresponds to one and excellent corresponds to five. well after substituting the numerical value we get a decision matrix. next we have to categorize the criteria into non beneficial and beneficial criteria, non-beneficial criteria are those criteria whose lower value is desired for example cost, we desire to have a product with lowest cost on other hand beneficial criteria are those criteria whose higher value is desired. The author extract the following characteristics of RPA-suitable tasks from these papers:

Syed, R, et al (2020)

Ravindra Savaram (2020)

Suri, et al (2017)

J. R. Slaby, P. Fersht (2012)

Criteria									
Price		**Service and Support**		**Reliability**		**Study**		**Evaluation and Contracting**	
Very high	1	*Excellent*	5	*Very high*	5	*Easy*	5	*Excellent*	5
High	2	*Very good*	4	*High*	4	*Medium difficult*	4	*Very good*	4
Moderate	3	*Good*	3	*Moderate*	3	*Difficult*	3	*Good*	3
Low	4	*Bad*	2	*Low*	2	*Hard*	2	*Bad*	2
Very low	5	*Very bad*	1	*Very low*	1	*Very hard*	1	*Very bad*	1

Table 2
Criteria

RPA/Critiria	Price	Serive & Support	Study	Reliability	Evaluation and Contracting
Uipath	Moderate	Excellent	Easy	Moderate	Very good
Blue Prism	Very high	Very good	Moderate	Very High	Very good
Automation Anywhere	High	Very good	Hard	High	Very good
SAP Intellgient	Moderate	Very good	Easy	High	Very good

	Non-benefit	Beneficial	Beneficial	Beneficial	Beneficial
RPA/Critiria	Price	Serive & Support	Study	Reliability	Evaluation and Contracting
Uipath	3	5	5	3	4,5
Blue Prism	5	4	3	5	4,4
Automation Anywhere	4	4	2	4	4,4
SAP Intellgient	3	4	5	4	4,2

Uipath	0,3	1	1	0,6	1
Blue Prism	1	0,8	0,6	1	1
Automation Anywhere	0,5	0,8	0,4	0,8	1
SAP Intellgient	0,3	0,8	1	0,8	0,9

RPA/Weightage	20	20	20	20	20	100
Uipath	6,67	20	20	12	20	78,7
Blue Prism	20	16	12	20	20	88
Automation Anywhere	10	16	8	16	20	70
SAP Intellgient	6,7	16	20	16	18,7	77,3

Figure 1 Calculation

In order to make all criteria comparable, the author does normalization in beneficial Criteria, the author divided the performance value in individual cell with the maximum value. For non-beneficial criteria the author takes the minimum value and divide it with the performance value of each cell. There is a difference in both beneficial and non-beneficial maximum value takes the denominator and in non beneficial the minimum value takes the numerator. The author does the same for all other criteria on solving. The author will get a normalized decision matrix, next step is

to assign the weightage to the criteria. Here is the sum of weight age is always 100 or 100 percent convert the percent into number and then multiply the weight is assigned to each criteria with its normalized performance value on solving, the author get the weighted normalized decision metrix. Next, add all weighted normalized performance value of each alternative to get a performance scope. Similarly, can obtain the performance score of all other alternative ranks can be allocated to RPA based on the performance score. Here the author can say based on the weightage assigned to each criteria, Blue prism is the best alternative among all other alternative as it is having Rank 1

5 Results and Discussion

5.1 Interpretation on findings

The result shows us, that Blue prism could be the best option for company to the ratio of price and comfortability. But it was just specific analysis, which did not include another components and conditions for broad observing. For big companies need more detailed analysis to choose the best RPA, which at same time will respond for their own requirements. Anyway, this theoretical MCDA method showed us, that if we are going to base on these specific criteria, which were mention above, Blue prism take the first place for implementing to companies in financial sphere, while using SAP ERP.

Although Blue Prism took the first place regarding MCDA method, but by the survey of employees, which were provided in SAP company, shows that they satisfy with current RPA (SAP IRPA). Mostly, because it is product of SAP and the results, which give the RPA are positive.

5.2 Discussion and comparison

Regarding MCDA analysis, we get Blue Prism RPA as a top RPA for company with SAP ERP. The calculation was provided by SAW method, where the author used 5 general criteria to make a decision. In calculation, we can see the ranks of RPA, so Blue Prism 1st, Uipath 2nd, SAP IRPA 3rd and AA 4th. But on another hand, if we are talking especially about SAP company, for sure, for them, their own RPA (SAP IRPA) will be the best. It depends on more broad observation, what kind of solution the customer needs and how much the owner can afford to spend. By survey, the author can provide, that employees in specific company are feel comfortable with their RPA and satisfy with work, which done, while automation in particular sphere such an invoicing.

For comparison, the author chose company in same industry as SAP company, with another RPA tool:

Oracle Integration with UiPath Robotic Process Automation Adapter

RPA helps you to create UI scripts that replicate behavior in the interface as if they were being done by a person. A script can be replayed using various input parameters by a computer, which is an application that simulates human input. Web software, character-oriented terminal programs, and native Windows applications all provide user interfaces that robots can communicate with. Vivek Acharya. (2020)

The UiPath Robotic Process Automation Adapter can be used in a variety of situations, including the ones mentioned below.

- Integrate with Systems That Don't Have Adapters or APIs - The UiPath Robotic Process Automation Adapter can be used to integrate with apps that don't have a converter in Oracle Integration or that don't reveal APIs.

- The UiPath Robotic Process Automation Adapter is a modern way to integrate with Oracle Integration systems that aren't natively supported. The adapter makes it easier to find robots in the UiPath Orchestrator that have been developed and deployed. Robots designed with RPA technologies can be named from an integration flow to communicate with applications and devices that were historically inaccessible to Oracle Integration due to a lack of exposed APIs or adapters. You will use the adapter to connect data to queues, tell robots to start jobs using queue data, and receive output from jobs.

- The UiPath Robotic Process Automation Adapter also helps you to use robotics to work with modified or expanded applications. APIs or an application adapter could not be able to provide additional features. You may use this feature in a standardized design by instructing a robot to perform these transactions using the UiPath Robotic Process Automation Adapter. Vivek Acharya. (2020)

Repetitive Human Activities May Be Automated

- The UiPath Robotic Process Automation Adapter can be used to automate basic manual processes that would normally be done by a person.

- RPA robots can perform routine activities that do not require decision making, such as data entry. You will use the UiPath Robotic Process Automation Adapter in Oracle Integration to automatically initiate these transactions. Vivek Acharya. (2020)

Oracle ERP and RPA

RPA (robotic process automation) simplifies the use of the Oracle ERP framework. It paves the way for a more error-free workflow, virtually eliminating lag time and assisting you in achieving peace of mind. Vivek Acharya. (2020)

RPA is a computer-assisted method of automating repetitive tasks. Machine-learning software may be configured to obey complex workflows in the same way as humans do.

It will modernize legacy systems by incorporating RPA into y ERP system. It can perform time-consuming logistical tasks like looking up information and entering it into Oracle in a matter of seconds. When these tasks are delegated to RPA, the whole company profits from smoother and less labor-intensive operations.

Artificial intelligence isn't needed for RPA technologies, but those who do will eventually "read" how use Oracle, allowing it to make intelligent decisions on your behalf over time. Over time, it becomes more profitable, resulting in long-term cost cuts and less overtime for the workers. Vivek Acharya. (2020)

The Research Questions

The first research question was based on MCDA method to know, which RPA could be optimal for company with SAP ERP. Regarding MCDA method with particular criteria, the author found, that Blue prism is the best solution RPA. It helped to make comparison and choose among the best RPA, the most fitted one.

The second research question was based on literature and survey, which was done in practical part. The author found, that for employees need make the work process optimised and faster, to be focus on major tasks. It keeps time and workers can work more and purposefully.

Practical implications

For managers became clear after giving practical implications based on findings, that: The procedures that can be automated are rule-based and routine, with structured input data. If the choices are explicitly specified in the business logic, robotics will make them. A high rate of exceptions will necessitate human interference and reduce robot efficiency. Individuals will assess the automation capacity using two sets of criteria: process fitness and automation complexity. Vivek Acharya. (2020)

Process Fitness - Below are several requirements for deciding whether a procedure is appropriate for automation:

- Rule-based

A pre-defined reasoning can be used to capture the decisions made during the process (including data interpretation). The rate of exceptions is either minimal or may be incorporated into the business logic.
Phase that is repeatable and/or automatable –
We can differentiate 4 types of processes:
• Manual & repetitive: the steps in the process are taken by the operator, and at least some of them are the similar every time the process is executed • Manual & non-repetitive: the process steps are performed by humans and can be specific every time the process is executed
• Routine and semi-automated: some of the repetitive steps have already been automated (using macros, Outlook rules, and so on)
• Automated: certain systems have also been automated using technology other than RPA.

Note - Processes that may remain manual or non-repetitive due to a high rate of deviations or variables that cannot be implemented into a business logic are not suitable candidates for automation.

- Standard input

The process's input should either be electronic and conveniently readable, or it should be readable using a technology that can be linked to RPA (such as OCR). An invoice with pre-defined fields is a good example.

Stable –
Processes that have been the same for a long time and are unlikely to change in the coming months are strong candidates for automation, given they also follow the other requirements.

Automation Complexity - This set of parameters defines how difficult a procedure is to automate:

- Number of screens

RPA operates by instructing the robot to carry out activities on the computer (when the screen changes, the logic has to be taught). The more screens there are, the more items to be recorded and programmed before the mechanism can be automated.

- Types of application

Some programs (such as the Office suite or Java) are easier to simplify, while others need a substantial amount of work (Mainframe, for example). The number of displays will also rise as the number of apps differs
Business logic scenario -
The number of decision points in the business logic increases the automation's complexity. Essentially, both may multiply the number of possibilities by two.

- Types and number of inputs

Standard input, as previously mentioned, is desirable. However, in some situations, a single standard input (such as an invoice) must be programmed for each provider that would be impacted by automation. Furthermore, non-standard input may be of varying degrees of difficulty, with free text being the most difficult. Vivek Acharya. (2020),

6 Conclusion

The main objective of the thesis is to evaluate options for RPA implementation in a company using SAP ERP, which was based on choosing the most popular and the fittest RPA. First, the author made observation of RPA market, then took the top several RPA and compared them by MCDA analysis. After analysis, found out the most relevant RPA such a Blue prism.

The first partial objective was to make a comprehensive overview of approaches to products and barriers of implementing RPA in ERP. After observation of RPA, the author wrote down the best ones such a Blue prism, Uipath, Anywhere and SAP IRPA(Contextor). Then made a short comprehensive overview in table, where you can find the most frequency question about RPA tools. Barriers of implementing RPA in ERP for those RPA, which the author mention, are common. For example:

1. the process must be well-defined optimized and repeatable without the need human interaction.
2. need to standardize processes across an organization
3. updated software environment

The results of the study show the following conclusions:
Several sources have been analyzed relating to the use of robotization of business processes. From tools (software products) to create RPA solutions the most popular are Blue prism and UiPath. As the most convenient method, I can prefer UiPath, as it is a simple and free environment for developing RPA solutions that has intuitive interface. Nowadays, the topic of this work is relevant, as such automation requires less resources than software refinement, which saves time and companies' economic resources.

Then, for the case study, author chose one of the branches of SAP company, which is located in Czech Republic, Prague to show how RPA can improve the business process and make it work faster. In 2018 SAP company bought Contextor SAS and made collaboration with SAP Leonardo Machine Learning portfolio. From Order to invoice team view, the process take several times to automate any process. For example, automation of invoicing. First, need to prepare the environment for it, fix often appears bags, optimize, send request to IT team, and test the updates. If everything works, confirm, and enjoy work process.

If we summaries the study to SAP company and their relation to RPA, the author based on comparation and survey, would like to say, that SAP company is satisfy and keep work environment favorable. They are on stage of improving the business process and foot with a digital time. For sure, the main factor is that they have own RPA and they are ambassador of their product. As a owner, they always want to be better and make for that a lot of work.

7 References

Osman, C. C. (2019). Robotic Process Automation: Lessons Learned from Case Studies. Informatica Economica, 23(4).

Vom Brocke, J., Maaß, W., Buxmann, P., Maedche, A., Leimeister, J. M., & Pecht, G. (2018). Future work and enterprise systems. Business & Information Systems Engineering, 60(4), 357-366.

Willcocks, L., Lacity, M., & Craig, A. (2017). Robotic process automation: strategic transformation lever for global business services. Journal of Information Technology Teaching Cases, 7(1), 17-28.

Madakam, S., Holmukhe, R. M., & Jaiswal, D. K. (2019). The future digital work force: robotic process automation (RPA). JISTEM-Journal of Information Systems and Technology Management, 16.

Jovanović, S. Z., Đurić, J. S., & Šibalija, T. V. (2018). Robotic process automation: overview and opportunities. Int. J. Adv. Qual, 46.

Kagermann, Henning, Wolfgang Wahlster, and Johannes Helbig (2013). "Securing the future of German manufacturing industry: Recommendations for implementing the strategic initiative INDUSTRIE 4.0." Final report of the Industrie 4.0

Anagnoste, S. (2017), "Robotic Automation Process - The next major revolution in terms of back office operations improvement", Proceedings of the International Conference on Business Excellence, Vol. 11

Asatiani, A. and Penttinen, E. (2016), "Turning robotic process automation into commercial success – Case OpusCapita", Journal of Information Technology Teaching Cases, Vol. 6 No. 2, pp. 67–74.

Alberth, M. and Mattern, M. (2017), "Understanding robotic process automation (RPA)", The CAPCO Institute Journal of Financial Transformation, November, Vol. Automation No. 46

Lacity, M. and Willcocks, L. (2015), "Robotic Process Automation: The Next Transformation Lever for Shared Services", The Outsourcing Unit Working Research Paper Series

Lacity, M.C. and Willcocks, L.P. (2017), "A new approach to automating services", MIT Sloan Management Review, Vol. Fall

Suri, V.K., Elia, M. and Hillegersberg, J. van. (2017), "Software Bots - The Next Frontier for Shared Services and Functional Excellence", Global Sourcing of Digital Services:

Micro and Macro Perspectives, presented at the International Workshop on Global Sourcing of Information Technology and Business Processes, Springer, Cham, pp. 81–94.

Slaby, J.R. (2012), Robotic Automation Emerges as a Threat to Traditional Low-Cost Outsourcing

Tran, D. and Ho Tran Minh, T. (2018), Workflow Methodology Development of RPA Solution for A Vietnamese Bank: A Case Study of Korkia Oy, Bachelor's Thesis, Laurea University of Applied Sciences

Fung, H.P. (2014) Criteria, use cases and effects of information technology process automation (ITPA). Advances in Robotics and Automation 3, pp: 124, doi:10.4172/2168-9695.1000124

Cramer J, Krueger AB (2016) Disruptive change in the taxi business: the case of Uber. Am Econ Rev 106(5):177–182

vom Brocke, J., Maaß, W., Buxmann, P. et al. (2018) Future Work and Enterprise Systems. Bus Inf Syst Eng 60, 357–366

Brandon Buccowich (2016). What is Robotic Process Automation. Accessed dated on 20/6/2018, Accessed dated on 20/6/2018

Clint Boulton (2018). What is RPA? A revolution in business process automation,

Tornbohm C (2017) Gartner market guide for robotic process automation software. Report G00319864. Gartner

Aguirre S, Rodriguez A (2017) Automation of a business process using robotic process automation (RPA): a case study

Van der Aalst, Wil MP, Martin Bichler, and Armin Heinzl. (2018): "Robotic process automation." 269-272.

Hofmann, Peter, Caroline Samp, and Nils Urbach. (2019): "Robotic process automation." Electronic Markets 1-8.

Willcocks, L., Lacity, M., & Craig, A. (2015b). The IT function and robotic process automation. The Outsourcing Unit Working Research Paper Series.

Lu, H., Li, Y., Chen, M., Kim, H., & Serikawa, S. (2018). Brain intelligence: Go beyond artificial intelligence. Mobile Networks and Applications, 23(2), 368–375

Van der Aalst, W. M. P., Bichler, M., & Heinzl, A. (2018). Robotic process automation. Business & Information Systems Engineering, 60(4), 269–272

Moffitt, K. C., Rozario, A. M., & Vasarhelyi, M. A. (2018). Robotic process automation for auditing. Journal of Emerging Technologies in Accounting, 15(1), 1–10

Evans, G. L. (2017). Disruptive technology and the board: The tip of the iceberg. Economics and Business Review, 3(17)(1), 205–223

Seasongood, S. (2016). Not just for the assembly line: A case for robotics in accounting and finance. Financial Executive, 32, 31–32.

TRIPATHI, Alok Mani (2018). Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool–UiPath. Packt Publishing Ltd.

Nazanin Vafaei, Rita A. Ribeiro, Luis M. Camarinha-Matos (2016). Normalization Techniques for Multi-Criteria Decision Making: Analytical Hierarchy Process Case Study.

S. Chakraborty and C.-H. Yeh (2009). "A Simulation Comparison of Normalization Procedures for TOPSIS," Comput. Ind. Eng., pp. 1815–1820

T. L. Saaty (1977). "A scaling method for priorities in hierarchical structures," J. Math. Psychol., vol. 15, no. 3, pp. 234–281, Jun.

T. L. Saaty (1980). The Analytic Hierarchy Process. New York: McGraw-Hill.

Syed, R., Suriadi, S., Adams, M., Bandara, W., Leemans, S. J., Ouyang, C., ... & Reijers, H. A. (2020). Robotic process automation: contemporary themes and challenges. Computers in Industry, 115, 103162.

Ravindra Savaram (2020), SAP Automation Using RPA, SAP automation, RPA for SAP

Suri, V. K., Elia, M., & van Hillegersberg, J. (2017, February). Software bots-the next frontier for shared services and functional excellence. In International Workshop on Global Sourcing of Information Technology and Business Processes (pp. 81-94). Springer, Cham.

J. R. Slaby, P. Fersht (2012), Robotic automation emerges as a threat to traditional lowcost outsourcing, in: HFS Research, pp. 1–19.

LE CLAIR, Craig; CULLEN, A.; KING, M. (2017) The Forrester Wave™: Robotic Process Automation. Forrester Research.

JOVANOVIĆ, Stefan Z.; ĐURIĆ, Jelena S.; ŠIBALIJA, Tatjana V (2018). Robotic process automation: overview and opportunities. Int. J. Adv. Qual, 46. Jg., Nr. 3-4, S. 34-39.

Santos, F., Pereira, R., & Vasconcelos, J. B. (2019). Toward robotic process automation implementation: an end-to-end perspective. Business Process Management Journal.

Vafaei, N., Ribeiro, R. A., & Camarinha-Matos, L. M. (2016, April). Normalization techniques for multi-criteria decision-making analytical hierarchy process case study. In doctoral conference on computing, electrical and industrial systems (pp. 261-269). Springer, Cham.

Gaudenzi, B., Borghesi, A. (2006): Managing risks in the supply chain using the AHP method. Int. J. Logist. Manage. 17(1), 114–136

Zahedi, F. (1986): The analytic hierarchy process – a survey of the method and its applications. Interfaces (Providence) 16(4), 96–108

Etzkorn, B. (2015): Data normalization and standardization.

Willcocks, L. P., Lacity, M., & Craig, A. (2015). The IT function and robotic process automation.

Bataller, C., Jacquot, A., & Torres, S. R. (2017). Robotic Process Automation. US 9555544 B2.

Brynjolfsson, E., & McAfee, A. (2014). The second machine age: Work, progress, and prosperity in a time of brilliant technologies. WW Norton & Company.

Russell Stuart, J., & Norvig, P. (2009). Artificial intelligence: a modern approach. Prentice Hall.

Asatiani, A., & Penttinen, E. (2016). Turning robotic process automation into commercial success–Case OpusCapita. Journal of Information Technology Teaching Cases, 6(2), 67-74.

Brynjolfsson, E., & McAfee, A. (2014). The second machine age: Work, progress, and prosperity in a time of brilliant technologies. WW Norton & Company.

Schmidhuber, J. (2015). Deep learning in neural networks: An overview. Neural networks, 61, 85-117.

Vivek Acharya. (2020), Robotic process automation (RPA) in Concert with Oracle Solutions.

Martin, I., & Cheung, Y. (2000). SAP and business process re-engineering. Business Process Management Journal.