Robotic Process Automation (RPA) As A Digitalization Related Tool To Process Enhancement And Time Saving

Research · December 2021

DOI: 10.13140/RG.2.2.13974.68161

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ROBOTIC PROCESS AUTOMATION (RPA) AS A DIGITALIZATION RELATED TOOL TO PROCESS ENHANCEMENT AND TIME SAVING

30.12.2021

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1 Introduction

Robotic process automation (RPA) refers to software robots that have been developed and deployed to automate repetitive and mundane work tasks for which precise rules can be defined. RPA follows predefined human activity in different user interfaces, for example, transferring data between systems and executing manual transactions. (I-Scoop 2021) Thus, this work addresses the use of RPA technology as a digitalization-related tool with which companies seek to streamline processes and achieve cost savings. This work can be important to the reader as it provides an understanding of what RPA is, what its operations are based on and most importantly, what benefits companies can achieve in their business through RPA. At a more general level, RPA is an important topic, as robotic automation and robots are emerging globally as mandatory part of technologies for doing business (Madakam et al. 2019). As industries are going through digitalization it is beneficial to have at least some understanding of robotics process automation and its impacts for the business of both small and large companies.

This work is limited to the robotic process automation as technology and is also focused on how companies technically develop and implement RPA robots into their business. The work also focuses on what benefits and challenges there may be in the implementation of RPA or what factors are critical for the success of RPA implementation. This work therefore focuses on examining the impacts and benefits of RPA as a technology in streamlining and improving the business processes of companies. The goal of this work is to acquaint the reader with RPA technology and to use case examples to highlight the achieved business impacts and benefits.

The report has been carried out as a literature review. The structure of the report is as follows: the second chapter introduces RPA technology. After reading it, the reader will understand how RPA works in information systems. The third chapter reviews the effects and benefits of RPA. That have been studied using real case examples from different industries. The third chapter also performs a SWOT analysis to identify the strengths, weaknesses, opportunities, and threats of RPA technology. In addition, the chapter includes a mapping study that maps how many scientific publications have been made about RPA. The fourth chapter presents the conclusions of the work. The fifth chapter proposes the final grade of work.

2 History and technical background of RPA

Prior to RPA, there were some solutions on the basis of which RPA was developed. Today, they all have an impact in the background. RPA also has certain features that set it apart from other solutions. Solutions can also be used in many different situations, and the impacts and benefits of these solutions are reviewed later.

2.1 History behind RPA

Robotic process automation is often seen as a turning point in process automation because of its technology. However, there has been a debate in the industry whether RPA is just a continuation of the technologies that preceded it. Prior to the RPA, three key predecessors have been identified: screen scraping software, workflow automation and management tools and artificial intelligence. (UiPath 2021) Even though RPA can work without any AI parts, it has been said that these three technologies together have made robotic process automation as significant a technology as it is today (Javatpoint 2021).

According to Alberth & Mattern (2017) the early forms of the current RPA were mainly screen scraping software that integrated new software applications with legacy applications, by extracting unstructured data from the presentation layer of web and then transforming the data into structured to be used, as legacy applications did not have the necessary means for automatic interfacing. Screen scraping is more efficient than manual work, but its capabilities are limited as its compatibility with modern systems and applications varies. In addition, its operational logic can be difficult to understand if one does not know HTML coding, as the screen scraping operations depend on it. These factors have led companies to look for more versatile and adaptable ways to automate processes. (UiPath 2021)

Workflow automation and management tools refer to a set of automated functions in a process that reduce the need for manual work done by human. These functions have to be repetitive so that the steps included can be predicted. (Javatpoint 2021) These tools aim to eliminate the need for manual data entry within systems, and thus, seek to improve speed, efficiency, and accuracy of processes (UiPath 2021).

Artificial intelligence refers to the ability of computers and their systems to perform processes and tasks that would normally require human input and intelligence to be done (UiPath 2021). There are three techniques, on which artificial intelligence programming bases on: learning, reasoning, and self-correction. There are many different applications of

artificial intelligence on offer, which means that its use can be applied to a very wide range of industries and sectors. Thus, the best-known technologies of artificial intelligence are speech recognition, image recognition, natural language generation (i.e., technology that converts structured data into intelligible language), and sentiment analysis, which analyzes subjective information. (Javatpoint 2021)

2.2 RPA technology

Robotic process automation is a technology designed to automate business processes and like humans, it operates through user interfaces. RPA aims to automate simple, repetitive, and established work steps, such as the transfer of personal data from one system to another. (Chappell 2016; van der Aalst et al. 2018) RPA is a computer-based software tool that enables the automation of high-volume and rule-based work tasks that include structured data and a predefined outcome (Asatiani & Penttinen 2016; Lacity & Willcocks 2016a). Asatiani & Penttinen (2016) mention that RPA performs the tasks assigned to it in response to events on display without communicating with the application programming interface (API). Since RPA doesn't communicate with API, it can be, thus, used more widely in the context of different software. However, RPA is not intended to automate entire businesses or systems, as it is aimed to support data transfer for employee between different business applications. (Institute for Robotic Process Automation 2015; Chappell 2016) RPA functions can also be activated by trigger events.

RPA solutions can be implemented using ready-made turnkey solutions or by doing everything from scratch by yourself. However, turnkey solutions have advantages over a company starting to make solutions from scratch. Typically, in such solutions, the company can focus on business and the service provider takes care of everything else around the RPA. (Digital Workforce 2021)

Before companies implement RPA solutions, they need to study existing processes to ensure that those processes can be automated (Smeets et al. 2021, p. 40-41). This must be done because it is not possible to automate all processes with RPA. According to a study by McKinsey (2017), only less than 5% of all processes are automated using RPA. However, about 60% of processes can be automated by at least 30%.

Criteria for examining the applicability of RPA are degree of standardization, rule-based nature, process stability / maturity, complexity, digitality of the data, structure of the data,

data type, application involved, process cost, case frequency and susceptibility to errors. That is, in short, the more standardized and rule-based processes are, the better suited they are for automation. In addition, according to this, the invariability of processes, the digitalization of data and the correct form and type are important factors when considering how far automation is possible, because if the data is not in digital form or processes are bad, the automation is not possible. The reliability of background systems is the last thing to consider. If the systems are constantly broken, then automation of processes is not profitable or possible. Lastly, the frequency of the cases and cost of the process are very big factors when considering what should be automated. As a rule of thumb, the more frequent and expensive the cases are, the more profitable it is to use RPA. However, it may also be highly profitable to implement RPA for monitoring purposes, if the monitoring has to be done around a clock, but actions monitored rarely happen. Even though complex processes may be hard to automate, very easy tasks may be also if errors are being made easily even when doing tasks manually. (Smeets et al. 2021, p. 41, 67).

Robotic process automation has three characteristics that distinguish it from other automation tools. First, many RPA tools are intended to be easy to use and thus do not require experienced programming skills. As a result, business process experts can learn to automate processes in just a few weeks. The design of the robot is quite simple, as different icons in the user interface describe the steps of the processes and they are linked to each other. When the user creates and connects the icons, the code that controls the robot's operation is generated automatically. (Lacity & Willcocks 2015; Lacity & Willcocks 2016b) Second, RPA works on top of existing systems, and therefore no systems or platforms need to be created neither replaced nor developed. RPA robot has access to systems like any other user by using the interface with its own login credentials. RPA robot only uses the user interface layer, so the programming code used in the system(s) remains intact and unchanged. In addition to that, robots do not store data for a longer period, they only store data during the process to be aware of the status of ongoing activities. Third, RPA is designed to meet the needs of enterprises, because it is a durable application platform in terms of scalability, security, controllability, and change management. By centralizing RPA robot(s) in enterprise’s IT support, they are deployed, scheduled, and monitored, which makes it possible to ensure consistency of operations, compliance with the company’s security rules, and continuity with the company’s business plans. (Lacity & Willcocks 2016c)

Asatiani & Penttinen (2016) mention that optimal tasks to be automated with RPA solutions are the kinds of, which are highly manual and do not require human's ability to compare different alternatives and make decisions depending on the outcome of the decision made. In figure 1, it has been modeled an outline of which tasks are suitable for RPA robots, based on the cognitive thinking and routine required by the task. As can be seen from the figure, work tasks that require cognition and human-like thinking, as well as non-routine work steps without a regular and repetitive task structure, are not ideal to apply RPA for. It has to be possible to precisely define the work steps step by step, and any options and events that may occur in the process must be considered so that RPA robot can function as desired (Asatiani & Penttinen 2016). However, it is mentioned that robotic process automation is also a powerful automation tool for complex processes, which are defined as ones to have subtle and dynamic cause-and-effect relationships if the steps connecting the process and management of multiple variables are defined (Lacity & Willcocks 2016b).

Consequently, it is open to interpretation which complex and cognitive processes with a limited amount of reasoning outputs should be automated with RPA. If a particular cognitive process is repeated thousands or millions of times by a human, it takes a lot of time and money. Alternatively, more money and effort could be invested in automating that process at once, and savings could be made in the long run.

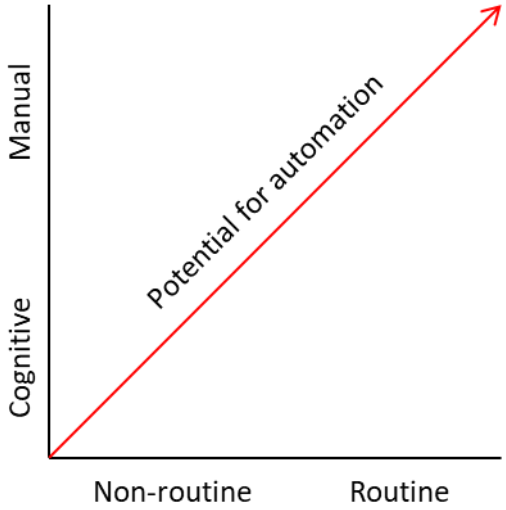

Figure 1 Potential for robotic process automation depending on task's characteristics (adapted from Asatiani & Penttinen 2016)

An automation manner, in which existing information systems and the way processes are run are not changed, is known as "outside-in". The described manner is very typical for robotic process automation. Usually, automation takes place on the so-called "inside-out" manner, in which case the operation of the automation requires changes to the systems and existing process logics. (Lacity & Willcocks 2016b; van der Aalst et al. 2018) Business process management (BPM), for example, includes these kinds of "inside-out" automation solutions (Lacity & Willcocks 2016b). Figure 2 illustrates the differences between RPA and BPM in processing information systems. RPA only works in the user interface, i.e. the presentation layer, operating only in the same part of the system as a human would, while the interactions of BPM solutions extend up to business logics and databases, at the IT architecture level. (Lacity & Willcocks 2016b)

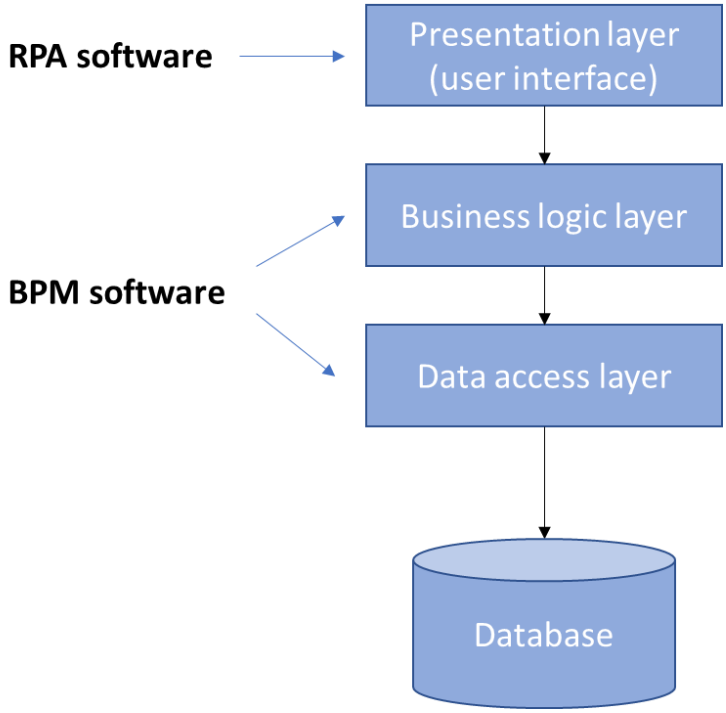

Figure 2 Different levels of automation (adapted from Lacity & Willcocks 2016b)

2.3 RPA case studies

RPA can be used widely in different applications. It has been proven through many different cases that RPA can for example reduce costs, shorter processing times, reduce human errors and automate repetitive tasks. (Ostdick 2016, Radke 2020 p.129) Some of the cases, where RPA has been used successfully include, for example in enhancing master data maintenance process, in electricity billing document management, and in business process automation.

Case: Master data management in manufacturing company

Radke, Trang, and Tan (2020) conducted a study on the potential of RPA to improve corporate master data management. Manufacturing companies today must cope with ever-increasing and more complex supply chain management. Master data is especially important for companies, as it can be used to generate key metrics as well as a basis for optimization algorithms for forecasting. Errors in the data have a significant impact on the usability of the data and therefore RPA solutions have been implemented in companies.

The study was conducted with the help of two different companies. One of the companies was an electronics company in Vietnam and the other was a pharmaceutical company in Singapore. The utilization of RPA in the electronics company was studied in the mobile phone repairing process. The problem was the elongation of telephone maintenance due to

the varying quality of the data and the differences between the two different systems. In the past, data had to be transferred manually between two different systems, product data varied between them, and clearing erroneous data required a lot of human labor. RPA was used to eliminate almost all manual work. The software robot automatically logs in to both systems and retrieves the required parts lists, after which the lists are compared against each other. After that it automatically makes production orders for needed parts in SAP. In the event of error situations, the person checks and corrects the error situations, allowing employees to focus on correcting material errors only when they occur and leaving them more time for other work tasks. The performance of the robot was evaluated using two groups, one group had a software robot in use and the other did not. The use of a software robot resulted in the following benefits: part order processing time was reduced by approximately 80 percent; job satisfaction increased as boring and simple work tasks disappeared; the number of errors decreased, as robots always function as programmed and their operation is always traced; the accuracy of the data rose to almost 100 percent and costs decreased significantly as unproductive work was eliminated and customer satisfaction increased.

Data from a Singapore pharmaceutical company suffered from similar problems as electronics companies. A lot of information was missing from the company's products' information or it was intentionally misrepresented due to mandatory information about which the registrar had no information. There had also been situations in the company where attempts had been made to find out the correct information, but the data had been forgotten to update afterwards. The built solution was well received, as usually such solutions are easy to implement in legacy systems and still create a lot of added value. The robot was used to standardize the process and perform a lot of data validation. All in all, the solution has the following benefits: the quality of the product data is significantly improved, as the robot fully follows the created processes, this allows even the product data of different markets to match; the length of the process was shortened by about 80% and the robot can work around the clock; in addition, the robot brought significant cost savings by reducing the need for overtime work as well as improving data quality and eliminating unnecessary work.

It can be said that RPA is well suited for master data management, as it really brings a lot of benefits to the company by reducing costs and improving data quality. All of this is needed and important to run a business profitably and reliably using data. However, RPA solution

designers must be careful when giving RPA direct access to master data, as programming errors in RPA can cause significant problems or data loss.

Case: Electricity Billing Document Management at Bydgoszcz City Hall

Sobczak and Ziora (2021) investigate what opportunities RPA brings to the development of smart cities from a technological point of view. Digital transformation in society is putting pressure on cities to develop into smart cities that are more efficient while providing better urban services and improving people's living standards in the city. Researchers have identified that RPA has the potential to improve the continuous growth in the level of process automation and digitalization sought by cities, as well as to increase the level of integration of current data sources to improve the management of urban services.

Thus, in this case example, Bydgoszcz city hall was chosen to be investigated as the subject of robotic process automation. Bydgoszcz is one of the largest cities in Poland, being a major industrial, logistical, and commercial center. It's also an important hub for transportation infrastructure. Bydgoszcz city hall has a six-person energy management team responsible for activities aimed at reducing the city's public sector's energy consumption. Due to the high workload related electricity billing, in July 2020 the team launched a public call for tenders for an RPA application, which would automate the processes of acquiring, distributing, and archiving the documents regarding electricity billing, received from an electricity supplier and electricity distributor. The rationale for the need for RPA application was, for example: the city has more than 1,400 electricity consumption points and the number is expected to grow in the future, the billing of the city's electricity and its units is affected by 14 different tariffs, and more than 20,000 electricity-related bills must be processed annually, and they arrive in physical form on paper.

The energy management team defined the functions and tasks that the robot wanted to perform: the robot is able to log in, such as a human, to the electricity supplier and distributor portals and download the latest electricity billing documents at least once a day; the robot must be able to identify document data types, convert them into digital form, collect the necessary data and continue to store it into a database; the robot must be able to identify and notify any changes in documents; the robot must be able to store the results it has made in a database from which a member of the energy management team can view them, and the

robot must be able to continue to operate even in the event of a change in the download or format of documents.

In November 2020, an outsourced company started manufacturing the desired robot and one month later, in December 2020, the software robot began operating in automated electricity billing. It managed to relieve the staff of city hall and the electricity consumption units of the need to manually rewrite the billing information received on paper into the systems. In the past, 300 people have been directly or indirectly involved in billing processes, but since the robot was launched, the need has fallen to one person. In addition, the robot transformed billing from operational work to analytical work, where only one person from the energy management team currently needs to work to resolve possible situations that deviate from the robot's normal operation. Starting a robot was also found to have positive effects on data quality in systems, as work that transfers data between systems can easily be monotonous and thus reduce the ability to concentrate on work when performed by human. The robot was also found to significantly improve the speed of billing process, as it processes incoming documents within 24 hours of when the documents appear in the electricity supplier's or distributor's portal. Moreover, as a side benefit of deploying the robot, energy companies achieved cost savings when they no longer had to print and send billing information on paper to the city hall and consumption units.

In this described case, the company that delivered the robot, maintained it for a year and provided training to city hall staff for € 35,000. Based on the identified benefits, it is reasonable to assume that the robot will generate significant cost savings in a longer period of time, and thus cover the costs of acquiring the robot. In addition, it can be believed that the robot will further improve the efficiency and quality of the billing process and increase the meaningfulness of work tasks in matters related to energy management.

Case: TECHSERV – Automation of financial processes

Carden, Maldonado, Brace and Myers (2019) conducted a study on how a company anonymized under the name TECHSERV that provides IT products strategically implements an RPA solution to support business processes and what benefits it entailed. The company wanted to implement an RPA solution to better meet goals and metrics related to efficiency, accuracy, cost, and process time. RPA solutions were built for tasks such as rule-based

practices, security audits, scaling and demand-side extensions, and on-demand monitoring reports.

The functions of the company in which RPA solutions were implemented were finance, accounting, taxation, and financial business. These departments include all the functions related to the company's finances. The goal was to automate existing processes by redesigning them and using this to create new types of work tasks for people, achieve cost savings, and improve productivity. With the help of RPA, benefits were achieved, for example, by transferring repetitive, manual work tasks to the robot, which allowed employees more time to learn automation and do other more demanding tasks. The various logs and reports used to track activity are also an important and good addition for a company. Automations also support real-time data analytics.

Some of the identified risks were external security threats and whether RPA solutions could negatively impact existing business. During the study, a total of 110 different software robots were built, with good results. Software robotics saved $ 100,000 per year in payroll costs for automated tasks, improved efficiency by 85 percent, and reduced invoice cycle time from 24 minutes per invoice to 3 minutes per invoice.

With the help of software robotics, significant cost savings and efficiency improvements could be achieved. The savings and improvements were a direct result of giving simple and automated tasks to the robot, leaving people more time to perform more meaningful and difficult tasks.

3 SWOT & Mapping study

To get better understanding of RPA, SWOT analysis and mapping study were conducted. SWOT analysis (figure 3) provides a good picture of pros and cons of RPA and its opportunities and threats. Mapping study, on the other hand, gives a good idea of what kind of situations RPA can be used in. By analysing the results, it is possible to get a good understanding of the state of RPA.

Strengths

As Sobczak and Ziora (2021) show in their case example, RPA offers the potential for significant cost savings by automating processes that are repetitive, predefined, and straightforward. For example, in the case city hall, the need for persons directly or indirectly involved in invoicing was reduced from 300 to only one. Studies (Barnett 2015; Lacity & Willcocks 2016a; Willcocks et al. 2017) show that RPA's cost savings arise as productivity increases and companies' need to recruit new staff decreases. In a situation where the number of tasks is increasing, it can be faster and cheaper to adapt the robot to changing needs or to introduce a completely new robot rather than to recruit more staff to perform the tasks.

From the case examples, it was found that RPA improves the quality of the work, as the number of errors in the processing of the data is reduced when the robot always performs the work task in the same way. In addition, it was found from the examples that it is possible to store information about the operation of the RPA robot in the systems. This further improves the quality when a human can, if necessary, check where a robot may have made a mistake and then correct it manually. (Carden et al. 2019; Sobczak & Ziora 2021)

Both Lacity & Willcocks (2016a) in their study and case examples (Carden et al. 2019; Sobczak & Ziora 2021) show that when RPA performs monotonous work tasks, the meaningfulness of work experienced by employees increases as work tasks become more analytical than operational. Lastly, from the case example, it can be said that the RPA implementation process can be relatively fast (Sobczak & Ziora 2021).

Weaknesses

Three RPA weaknesses were identified. First, the RPA software always works in a routine manner, which means that if even a small change occurs in the process, it will cause an error in the operation of the robot. This requires human action in order to resolve the error and get

the robot to continue working. This leads to the second challenge identified. For RPA software, there must be good monitoring and logging systems that can track errors that affect the operation of the robot and, on the other hand, the errors that the robot may make. This means that companies must have a separate maintenance team for RPA solutions, or they can purchase the maintenance from RPA turnkey solution provider. (Toolbox 2021) The third weakness is quality of source material, data, needed. The robot needs structured and high-quality data to work. Otherwise, the robot will not be able to function, and this will cause a need for data transformations, which again will require human input. (Kääriäinen et al. 2018)

Opportunities

The integration of RPA technology with artificial intelligence applications is seen as an opportunity to develop RPA operations. The computational efficiency of computers has increased significantly, which has affected the development of artificial intelligence. For example, machine learning (ML) can analyze large amounts of data and learning from it in real time. In addition, deep learning and reinforcement algorithms can be used more widely thanks to powerful graphical processing units. RPA can utilize the cognitive decision-making ability of artificial intelligence, allowing it to be utilized more widely in a variety of technical applications. Combining artificial intelligence with RPA overcomes RPA's challenges, for example, in processing unstructured data, decision analytics, and rule-based decision making. In addition, artificial intelligence can monitor the operation of a rule-based RPA. Such a combination of technologies could perform more complex and less predetermined tasks. (van der Aalst et al. 2018; Ng et al. 2021) Combining artificial intelligence with RPA also leaves it open to interpretation whether it might make sense for companies to start automating cognitive work tasks that have to be repeated often and that also take a reasonable amount of time from people, for example because of decision-making. Artificial intelligence could potentially solve such decision-making problems fast enough for automation to be profitable.

More complex tasks and process improvements are another opportunity that is can be achieved with RPA. When RPA is handling all the repetitive and labor-intensive tasks, data accuracy, process speed gets better, and costs get reduced. Because of this, employees that used to do these tasks can now be moved to more complex tasks. This both benefits the

employees that can develop their skills and companies that can use the same employees for more complex and difficult tasks. (Carden et al. 2019; Radke et al. 2020)

Acemoglu & Restrepo (2018) have shown in their study that changing demographic factors may be one factor influencing the adoption of new technologies such as RPA in companies. They mention that the change in the age structure of the working population will accelerate the deployment of robotics, as there will be an increasing shortage of middle-aged (26-55 years old) workers in the future as the share of older workers (over 55 years old) in companies increases. Research shows that countries where the number of middle-aged workers is decreasing faster than the number of older workers, are investing significantly more money in robotics, developing new technologies and following adopting them in operational activities. Thus, RPA can be seen as a solution to shortage of labor in the future as the productivity can be increased by employees to more demanding tasks.

Threats

Three threats related to RPA were identified. One of the risks was that advanced software will make RPA redundant and another that there are not enough resources to help with implementation. (Capgemini 2020; Basware 2021) Moreover, fear of job losses in a company may arise due to implementation of RPA solutions (Deloitte 2017).

RPA is used to support existing systems and extend their lifespan. However, at a time when legacy systems no longer perform their functions as required, existing RPA solutions become useless. This is because, in general, the new and modern systems that are being introduced include, for example, artificial intelligence solutions that perform the same tasks as RPA solutions, as well as many others. (Basware 2021)

Companies sometimes do not understand the amount of work involved in implementing RPA and this results in the company not having enough resources to implement the solutions. As a result, companies may adopt solutions that are not appropriate and do not meet all the requirements and involve security risks. (Capgemini 2020)

Deloitte (2017) mentions in the report that regardless of the size class of the RPA implementation, it causes disruption in the company and fear of losing jobs. Even though RPA is seen as improving the meaning of work and enabling the transition to more challenging tasks, the fear of change or leaving one’s own work is always present when RPA is implemented. The report suggests that companies should have an iterative approach to

organizational change management right from the beginning. The processes related to RPA must be able to be clearly explained so that stakeholders can understand the changes made behind the implementation, and thus mutual trust can be built in the company.

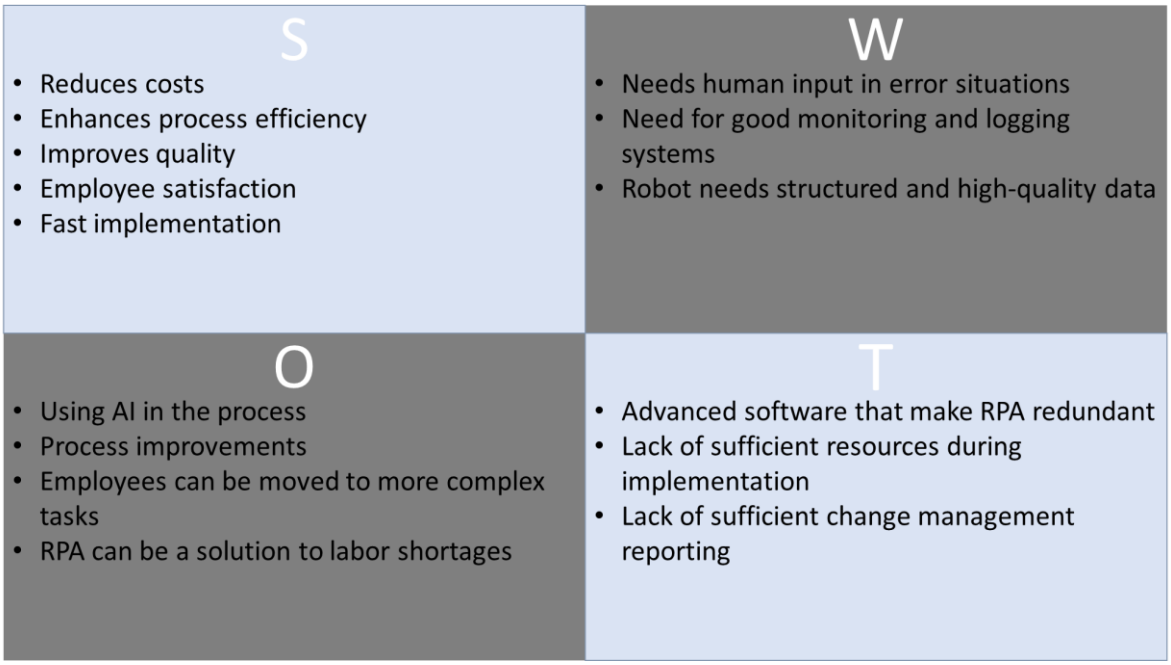

Figure 3 SWOT analysis

Mapping study

We conducted a simple mapping study of how many scientific articles on RPA have been written in the last 5 years using the SCOPUS database. The mapping study was conducted using the keyword "robotic process automation" and that phrase has been searched for in article titles, abstracts, and keywords. According to the database, the number of scientific publications (figure 4) on the subject has been very low in 2016, the first year of review. Only five articles have been published that year and only six the following year. However, in 2018, the number of articles has increased significantly, to 33 articles, and the annual growth since then has been high. In 2020, 132 articles were already published, and in 2021, right after the beginning of the third quarter, number of articles are at almost the same point as at the end of 2020. (Scopus 2021)

Scientific articles on the topic are divided into many different fields. Two-thirds of the articles fall into three different areas: computer science, engineering, and business. Computer science-related articles accounted for one-third and engineering and business-

related articles for a total of about one-third. The remaining one-third were distributed in small pieces to other areas, many of which, however, would fit well into the three largest.

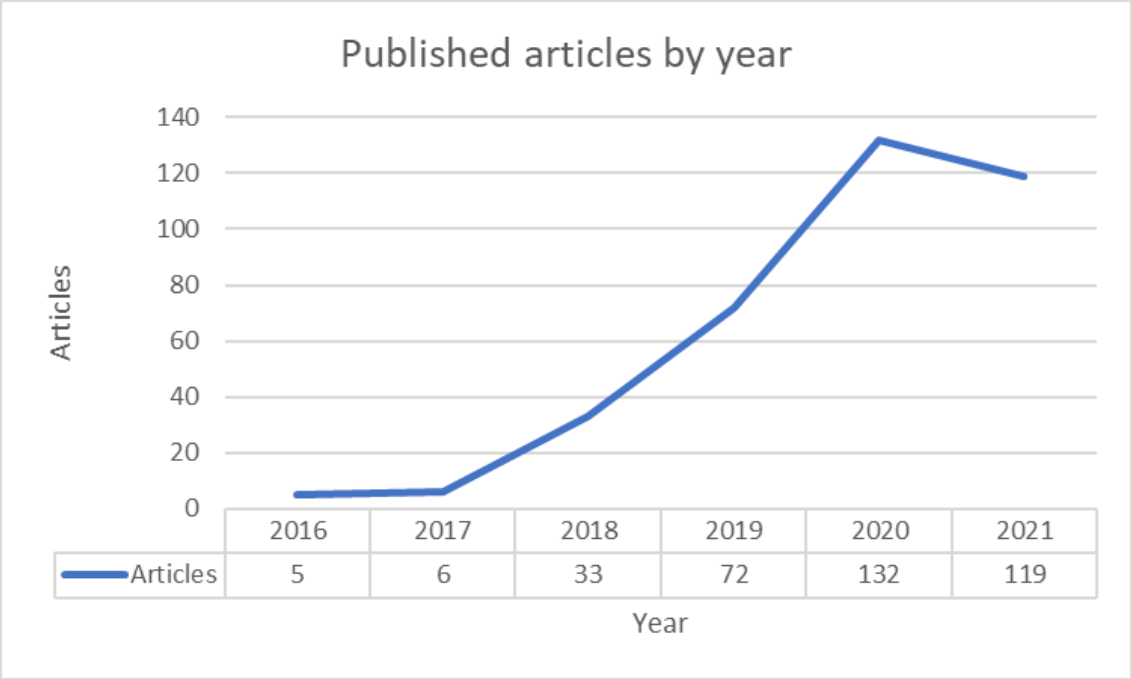

Figure 4 Published "robotic process automation" articles between years 2016-2021 (Adapted from Scopus 2021)

4 Conclusions

This work addressed the impact and benefits of RPA in process development and time savings. The topic was approached with the help of a literature review and in addition, case studies on the benefits of RPA were reviewed. In addition, a mapping study was conducted on how many scientific articles have been written about RPA and in which industries they are divided. These means were used to meet the objectives of the work, which were to acquaint the reader with the RPA and its effects and benefits on business.

RPA clearly differs from other technologies in three different ways: RPA can be used without in-depth programming expertise, RPA works at the interface level, so it does not affect the background code of applications in any way, so there is no need to make any changes or new features; and RPA is a good option for companies, because it is easily scalable and its technical operation and changes can be tracked. RPA is best suited for tasks that are routine and involve predefined process steps. This excludes RPA without AI from tasks and processes that require deeper cognitive thinking and decision-making between different things. But when RPA and AI are used and case repetitions are significant, it is possible to automate these kinds of tasks also. RPA solutions can be provided on a turnkey basis or companies can build them themselves. Also, when implementing the solutions, it should be thoroughly considered, what processes can be automated and what cannot be, by using certain criteria.

The effects and benefits of RPA on business operations were examined using three different case examples. Case examples related to master data management, document management, and automation of financial management tasks. The impacts and benefits that companies received from using RPA were streamlining processes, saving time, reducing costs, increasing the meaning of work, increasing customer satisfaction, improving quality, and a clear reduction in manual labor.

RPA was found to have several strengths, with an emphasis on improving process efficiency, cost savings, and quality improvement. Weaknesses identified were the human need to cope with problem situations, the need for good and comprehensive monitoring solutions, the need for high-quality starting material. RPA also has many opportunities, including the potential use of artificial intelligence in processes, the potential to streamline processes, the opportunity to be a response to the changing age structure of the workforce, and the ability

to transfer employees to more demanding tasks. External threats include new advanced systems that may make RPA solutions unnecessary, the fact that companies do not have enough resources for RPA, and lack of sufficient change management reporting, which can cause fear of losing jobs in a company.

Finally, a mapping study was conducted to examine how many scientific articles have been written about RPA. The mapping study was conducted by examining the titles, abstracts, and keywords of the articles. Until a few years ago, the number of articles was only a few copies a year, but today their number is growing significantly every year. RPA is clearly of increasing interest to companies and researchers due to its good impact and benefits.

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