

# EMPLOYING RPA AND AI TO AUTOMIZE ORDER ENTRY PROCESS WITH INDIVIDUAL AND SMALL-SIZED STRUCTURES: A SME BUSINESS CASE STUDY

[Využití RPA a AI pro automatizaci procesu zadávání objednávky malých a středních podniků: SME případová studie]

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**Abstract:** Digitalization is a megatrend which shows an even growing importance for industrial business development and marketing since the Corona pandemic. Its productivity-boosting and efficiency-raising effects have widely been researched in science. Especially SME have a backlog to enhance their digitalization level and take profit from digitalization measures, because they lack the necessary tacit knowledge and their process environment is characterized a small number of repetitions, but a high level of individual arrangement. Therefore, their processes are difficult to be standardized and digitalized. AI (Artificial Intelligence) and RPA (Robotic Process Automation) are 2 digital technologies that can be a tool to overcome these difficulties and automatize also processes that are individual and not much repetitive, in order to gain advantage of automation also for these processes. The use of AI and RPA could therefore become a driver of organizational marketing performance. Unfortunately, the use of AI and RPA which is a relatively new tool, has not been researched in the particular context of a typical SME order entry process, which is characterized by relatively few repetition and a high degree of unstructured data. There is a huge gap in understanding the role which AI and RPA could play for this task and other similar tasks in order to improve productivity of SME's administrative processes. The objective of this work is to measure the input of a combined RPA and AI application, which has been developed basing on scientific findings, on the performance of the order entry process, hypothesizing a time economy of >50% towards classical ways of working. It is a second objective to conclude which role RPA and AI could have for similar business cases and which input it could generally have for business performance of industrial SME, linked to its input on administrative processes. Therefore, this article measures and explores the input of a self-developed RPA and AI tool on a SME order entry process, based on primary data from process time registrations. In a case study of SME in Germany, data has been collected from daily order entry process. Productivity criteria have been measured and compared if using the classical order entry tool, and if using the new AI application. The result is that the new AI tool shows a significant time economy (>50%), payback of less than 3 years and is therefore able to improve organizational performance. However, other doubts about the superiority of RPA-AI assisted tools over traditional ways of working, especially within SME, remain.

**Keywords:** administrative efficiency, artificial intelligence, digitalization, robotic process automation, SME.

**JEL classification:** M15, M16

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## Introduction

Is the use of AI and RPA beneficial to SME who want to digitalize standard routine tasks which are typical for SME, means highly individual and little repetitive? This article explores the input of a self-developed combined RPA and AI tool on a SME order entry process. In a case study of SME in Germany, data has been collected from daily order entry process. Digitalization is a key driver of organizational performance. It will drastically change the business environment (Brynjolfsson and McAfee 2014, Seiter et al. 2016, Boes et al. 2018, Alqam and Saqib 2020). This change has even accelerated due to the Corona pandemic (Fitriasari 2020, Müller-Török and Prosser 2021). Today, many companies thrive the evolution

of their business model by holistically transforming their traditional model according to market needs in the age of digitalization (Vendrell-Herrero et al. 2017, Verhoef et al. 2019, Ritter and Pedersen 2020). Next to this digital transformation, digitalization can also be used to standardize and automate processes and gain significant productivity progress. As a result, digitalization leads to a higher level of innovation performance (Salmen 2021) and generally higher productivity linked to time economies, process simplification and automation (Will, Campbell and Holmes 2015; Eichhorst et al. 2017; Eller et al. 2020; Rivaes et al. 2020). Properly implemented digitalization leads to higher financial performance of companies (Eller et al. 2020). Many particular aspects within digitalization which create value, have been explored: Digitalization creates new ways of social habits and the functioning of our economies (Eichhorst and Buhlmann 2015, Eichhorst et al. 2017), allows to produce and promote items in batch size one, and thus individualizes production and sales (Kaufmann 2015; Käfer 2017; Rützel 2017; Ivanov, Dolgui and Sokolov 2019), and strengthens the ability of companies to customize their products (Bharadwaj et al. 2013), allows a more valuable communication (Uzunkaya 2020) and is a prerequisite to Digital Servitization (Grandinetti et al. 2020). The use of digital tools in order to replace or assist to classical working steps can increase the benefit of the traditional working environment. Therefore, many scientific effort has been conducted to measure the input of specific tools such as CAD software (Lima et al. 2017), engineering software (Fastermann 2014; Silva, Mathrani and Jayamaha 2019), PIM systems (Salmen 2020) AI (Gerst 2019; Chalmers, MacKenzie and Carter 2020), Social media and SEO (Zhao et al. 2019, Zhang et al. 2020, Barrett and Herten 2021) and big data analysis related to AI (Chumnumpan and Shi 2019; Chalmers, MacKenzie and Carter 2020; Ding et al. 2020). Results of the inspection of the input that digitalization has on business performance, is that it creates value and increases business performance, if requirements are fulfilled. But, even though beneficial results from digitalization were reported, there is still a stagnating global productivity growth for 2 decades now (van Ark 2015), concluding that the current development in ICR technologies would still require more time to create results and need intangible assets such as tacit knowledge within an organization, to show positive effects (Gal et al. 2019, Bettiol et al. 2020). Digitalization is a social-technical process (Autio et al. 2018), which requires a wide range of resources, strategic skills (Eller et al. 2020) and knowledge in order to create value for the implementing company (OECD 2017, Kraus et al. 2018). Due to these complex requirements, many companies fail to take profit from digitalization (van Ark 2015, Gal et al. 2019), because they are overchallenged by the complexity and lack resources (Verhoef et al. 2019). Especially for SME, the situation is threatening, because due to their size, they lack knowledge, proficiency, finances and contacts (Ledwith and O'Dwyer 2009, Söllner 2014, Ernst & Young 2018, Ratmeyer 2018, Snihur and Wiklund 2019). Therefore, their access to tacit knowledge and their abilities to implement digitalization properly, is weaker than for bigger companies. As a consequence, they suffer from a digitalization backlog towards bigger companies (Sames and Diener 2018, Eller et al. 2020). Also, they are threatened particularly by an increasing shortage of employees, due to aging society. Due to the weakening access to working staff, SME have more and more problems to fill vacant jobs and grasp growth potentials. Here, AI and RPA could be a solution to replace human labour by automated software. One aspect of a smaller business model is by nature the fact that many daily operations occur less often than in bigger companies and are thus more difficult to standardize and automate. Unfortunately, high frequency and low complexity is a key prerequisite to automate processes within the digitalization methods of business process management (BPM) (Wewerka and Reichert 2021). As the general activity range for a business model stays the same, whether for a small or a big enterprise, this fact often leads to a job enlargement for employees in SME. These prerequisites are the contrast of the cited requirements for digitalization, so the abilities of SME to digitalize their business, are even weakened further. Finding answers to the question,

how SME could nevertheless digitalize their typically individual and less repetitive main processes, is therefore very relevant. How to automatize processes that are characterized by a high level of individualism, and a low level of standardization and repetition? This question is discussed few in science. Here, AI together with RPA could be a solution. AI enables computers to act in a way which is typical for human intelligence and thus perform more complex tasks (Chalmers, MacKenzie and Carter, 2020). AI, combined with machine Learning (ML) allows machines and software to learn self-reliantly and could thus accomplish tasks in SME which are not enough standardized and repetitive to be subject to usual digitalization measures. Unfortunately, little has been undertaken in research to explore the input of AI on the digitalization of these processes within SME. This work explores the link on the basis of case study data from a German SME which developed an AI tool to digitalize its order entry process.

## 1 Related Literature

RPA is the fastest growing domain within the professional software market, and increased by nearly 40% in 2020 (Turcu and Turcu 2021). Its advantages and disadvantages have widely been discussed on a general basis, citing that RPA can create benefit even under the circumstance of less frequent process execution compared to other methods of business process management, but it also requires structured and repetitive data which it can process on a ruled-based logic (Lacity, Willcocks and Craig 2015; Lacity and Willcocks 2016; Hindel, Cabrera and Stierle 2020; Beerbaum 2021; Turcu and Turcu 2021).

However, most of these studies concern bigger companies whose processes are repeated frequently and are highly standardized, whereas SME often suffer from lacking knowledge, backward management level and processes that are less accessible to standardization (Dai 2021, Nechiporenko 2022).

For SME, only few cases have been researched. For instance, a combined approach of using RPA and OCR in order to automatize key processes within a SME recruitment process, was analyzed by Turcu and Turcu (2021), and could obtain rapid improvements towards the manual labour process. But the success depends on the character of the process (implementation of RPA for dynamic and creative thinking processes that deal with unexpected events or require decision making, would probably fail).

Lacity and Willcocks (2016) researched the use of RPA in Telefonica O2, stating that until 2015, already 160 robots process between 400,000 and 500,000 transactions each month, obtaining a reduce of 80% of telephone calls that had to be treated by humans. Despite these advances, RPA is a tool that must be used in context to other measures within business process tools and can also fail, for instance because robots need more instructions than humans, and technical infrastructure must also grow together with implementation of RPA (Lacity and Willcocks 2016).

Due to the higher automation rates towards other departments, accounting implemented RPA relatively early, generating many examples for user cases in companies like Hewlett Packard, Walgreens, and others. Target of automation were invoice creation, quarterly financial report generation, tax accounting, and payment processing, and several authors have cited case study examples for a successful use of RPA (Jędrzejka 2019; Gotthardt et al. 2020; Azman, Mohamed and Jamil 2021; Dai 2021; Nechiporenko 2022), showing that RPA could obtain faster processing, improved accuracy and lower costs, but also stating that barriers of automation need to be explored.

Some authors treat the subject of combining RPA with OCR to recognize data and later enter it with RPA into the software system, thus replacing keyboarding as current method for inputting or feeding data into computers (Desai et al. 2021, Patel et al. 2021), stating a confidence level of 98%. Unfortunately, the researched process of invoice processing, has some structural differences towards the topic of this paper (order intake).

The option to successfully use RPA in marketing automation to develop a web scraping engine has also been analysed (Florentina 2020).

The results of these studies show, that there are manifold topics for the use of RPA. RPA is mainly used where processes have already a high degree of repetition and standardization, which is the case in bigger companies and in accounting departments, explaining why most researched cases concern these fields. But, the studies also reveal that next to high advantages of RPA, the implementation also brings a lot of challenges: identifying suitable processes (Hindel, Cabrera and Stierle 2020; Hofmann, Samp and Urbach 2020; Carraro 2021; Ribeiro et al. 2021; Turcu and Turcu 2021), insufficient confidence rates (Andrade 2020), lacking knowledge within the team, or lacking team acceptance (Beerbaum 2021). This why the majority of RPA projects fail (Hindel, Cabrera and Stierle 2020). More research is thus welcome to explore the reasons and improve success rates. RPA is a technology which is still in its infancy (Jędrzejka 2019; Andrade 2020; Flechsig, Anslinger and Lasch 2021). At present and in future, there will be further development, and more research is needed to understand the impact which RPA can have in various situations.

As a consequence to lacking knowledge, less structured processes and a traditional management style, SME are underrepresented in the current research (Nechiporenko 2022). A specific business case within a SME, where unstructured data had to be inserted within an order entry process, has not been analysed which shows that the current case study is a new original and relevant case.

Results also reveal that each user case is individual, which has several consequences. First, each business case must be analysed separately according to its specific background and is individual. Second, a combination of several tools among RPA (for instance: OCR or AI) can be necessary related to the specific user case, which even increases the individual level. More research concerning specific questions is welcome, to allow a comparison to future cases.

Altogether, results of the literature review show, that more research is needed, especially concerning the use of RPA within SME. This paper inspects the use of RPA for order entry process in a SME. The prerequisites of this research case represent an original research topic which, in past, has not been researched.

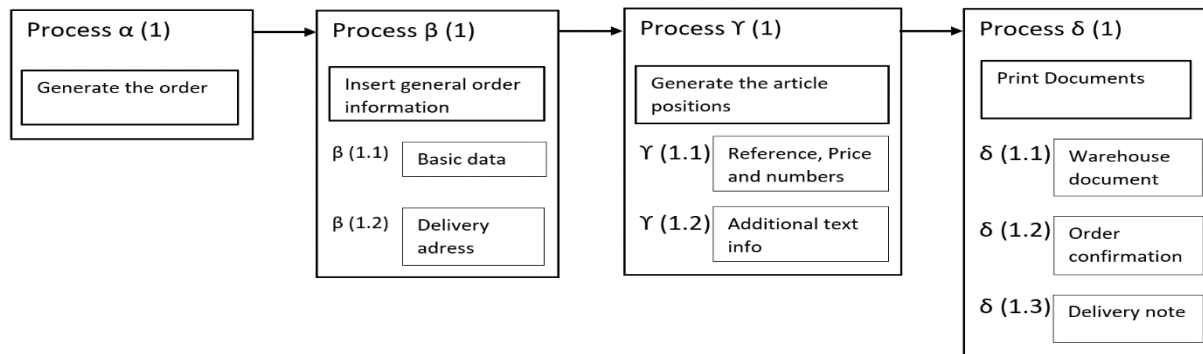
## 2 Case study

### a. The researched company and its situation

TKG is a small family-owned business which was found several decades ago and has an annual turnover of ca. 1.5 million Euro. These revenues are effectuated mainly with B2B trading companies whose business model is to delivery industrial C-part goods such as waste bins, ashtrays, office equipment, tools, working safety products and similar items. These trading companies strive to diminish their warehouse inventory volume and administration cost. As a consequence, many of them use the abilities of their suppliers (TKG, for example), who have to invest in stock volumes and arrange the whole delivery procedure within a drop shipment

handling. Expected delivery is within 3 days. So, the order volume of these traders is usually very small (down to batch size one) and the administration cost is very high, as TKG has to manually insert the unique delivery address of every ingoing order when generating the customer order. Also, the traders use their own software and oblige suppliers to adapt to it, for instance when automizing their process via EDI. TKG is therefore not able to set own standards and oblige its customers to adapt to them. Currently, the overall wage cost of the company is by 20% effectuated by the order entry process and resulting administrative tasks (order confirmation into the customers Web EDI database, settling an invoice etc).

**Figure 1:** Structure of the traditional process



Source: own figure

The traditional order entry process which is shown in figure 1 begins with the reception of a PDF order from a customer. It is opened by the operator who then uses the company's ERP system to generate a new order on the account of the customer ( $\alpha$ ). In the second step ( $\beta$ ), general order data is inserted, such as delivery conditions, desired delivery date and the delivery address which often has to be inserted manually if it is not the address of the trader. Then, each article has to be inserted and its order volume and price amended ( $\gamma$ ). Sometimes, additional text is needed that has to be added under the article. In the last step, the order needs to be confirmed via mail, fax or letter, and a packing note for the warehouse is printed ( $\delta$ ). Whereas price, reference number and additional text info has to be inserted for every article individually, processes  $\delta$ ,  $\beta$  and  $\alpha$  have to be done only once per order.

The time consume for process (1) can thus be described as follows:

$$y_1(x, \alpha, \beta, \gamma, \delta, \varepsilon) = \alpha_1 + \beta_{1.1} + \beta_{1.2} + n \cdot (\gamma_{1.1} + \gamma_{1.2}) + \delta_{1.1} + \delta_{1.2} + \delta_{1.3} + \varepsilon_1 \quad (1)$$

with  $n$  = the number of articles that belong to the order and  $\varepsilon$  other time consume and  $y$  = the process time (developed by the author).

The current process suffers from several disadvantages. Firstly, the manual work requires lots of time, especially when the delivery address has to be inserted manually. Also, for every information (delivery address, insert next article, check availability of product), a new template has to be opened which is circuitous. The manual entry of the address leads to mistakes due to wrong typing, which is the second disadvantage. Thirdly, as this task requires overarching activities and knowledge to related jobs (purchase, warehouse, price agreements), it overchallenges and fatigues the operators. The market lays under huge price pressure, and it is also more and more difficult to find or replace qualified stuff.

The intention of the management is therefore to digitalize this process and diminish the related costs. The object is to enter at least fifty percent of the daily orders automatically into the system without the nasty manual labour. In the past, this project could not be put into reality, because of the following constraints: Firstly, customers were reluctant to use a TKG standard. Any solution would therefore require to generate a standard that would allow to process every of the different customer standards. Mainly, customers send the orders via PDF. But these PDFs are varying considerably concerning length, page partition and information display, even for one single customer. Under these circumstances, a recognition of the order information was not possible in the past. A solution to this problem must be found, if order entry should be automatized.

In the software market, there are companies who offer automatized and individualizable RPA and AI solutions for similar purposes, for instance LOBSTER and SEEBURGER. During a study about software costs and expected return, TKG evaluated these existing software solutions as not appropriated for the own business case in terms of expected ROI. Therefore, it was decided to develop an own tool in cooperation with the South Westphalia University of Applied Sciences.

#### **b. Prerequisites for and requirements of the automation software: RPA, AI and OCR in the case of TKG**

In literature, the criteria for business process management as a standard procedure to automatize process steps with digitalization measures, requires processes that are characterized by little complexity, structured information and a high degree of repetition (Wewerka and Reichert 2021). In order to automatize processes, the business process management standard would identify those processes which are repeatedly effectuated, set a standard and digitalize it (Szymanska 2021). This new digitalized process would become part of the ERP system. In the TKG business case, the incoming orders are unstructured because in the PDF files, the text lines are not defined, field borders are not respected by the customers' software and there is unstandardized additional information in some of the orders. Also, the number of process repetition is limited. A software application which would allow to capture these offers nevertheless, would require to identify the given information in the PDFs. Several requirements have been identified of the management: The new software must work unattended and thus mimic the work of a human being in order to fulfil the primary goal to create economies, be intelligent enough to recognize relevant information within the order and transfer it into a digital information, must capture this information, and create an interface to the ERP system to where it delivers the order data.

The ability to mimic human labour is provided by RPA solutions. RPA is a relatively new technology that automates jobs which normally only humans can do. Therefore, RPA is able to identify elements in the surface of software tools, to detect human action and repeats it unattended (Ribeiro et al. 2021, Turcu and Turcu 2021) . RPA can create benefit even under the circumstance of less frequent process execution compared to BPM, but it also requires structured and repetitive data which it can process on a ruled-based logic (Lacity and Willcocks 2016; Hindel, Cabrera and Stierle 2020; Beerbaum 2021; Turcu and Turcu 2021). As the incoming orders are individual and not structured congruently, an additional application is needed to transfer the incoming data in a way that it fulfils these requirements. The detection of text within an individual PDF file is a task which requires intelligence similar to human intelligence. Artificial intelligence (AI) allows nowadays to automatize processes which could in the past only be effectuated by humans (Etscheid 2019). Nowadays, AI is able to learn to detect, understand and work with contents of a graphic PDF file. OCR (Optical character recognition)

is a classical software function which allows to extract text information from a picture (Etscheid 2019). But in order to interpret and then process this information, the combination with AI and RPA is necessary. For this purpose, it is not enough to just be limited to the abilities of OCR, because data must in addition be structured and sorted into the corresponding information groups (article number, delivery address, street, ZIP code etc) in order to be used and transferred into the ERP system. That means, additional intelligence is necessary. If RPA is combined with machine learning, the RPA procedure is able to learn how to work with incoming data more efficiently and effectuate the recorded processes more effectively (Ribeiro et al. 2021). Also, the accuracy level of the whole process can be increased by the AI learning process (machine learning) (Ribeiro et al. 2021). Once the order data is recognized, understood and captured, it should be entered into the ERP system automatically. Therefore, the planned RPA procedure generates an API solution as well.

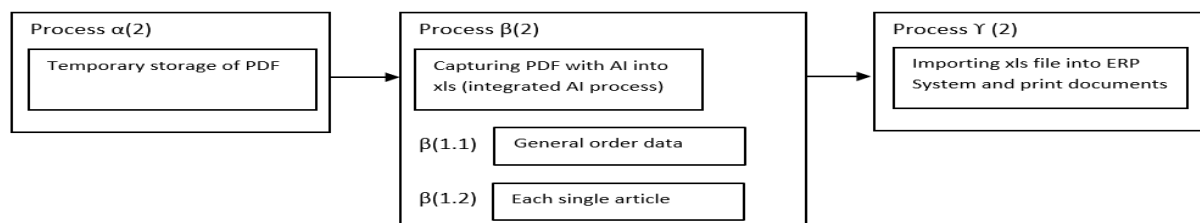
As a consequence of these measures, the operators would no longer have to enter orders manually and would avoid typing mistakes. They could concentrate on other tasks instead. Also, the replacing of human labour by robots would represent a huge time economy of human work.

### c. The new order entry tool

As we discussed, a rule-based approach without any use of AI lacks the necessary requirements in this case, as data is not enough structured, individual, visual, and repetition level is low. Therefore, a development order had been given to the South Westphalia University of Applied Sciences in order to develop a ML-operating AI tool which is able to perform the necessary process steps in cooperation with a RPA software, in a digital way.

Figure 2 displays the new process in a comprehensible way in order to understand its functioning.

**Figure 2:** Structure of the new RPA-AI process



Source: own figure

The new order entry process starts from a MS Windows folder where all PDF files are saved into manually ( $\alpha_2$ ). The AI and RPA process  $\beta_2$  begins with a manual starting impulse. It is recorded in a way that it detects the PDF files in the folder and starts the capturing procedure of the PDF order data. Therefore, it begins with OCR operation to detect the content of each PDF once the PDF is opened. The most important information in order to correctly assigning the order data, is the identification of the customer and the article number. Therefore, within the OCR detection process, the AI uses the neural network register to compare the detected data with a database in the background which contains distinct information like article numbers, names of articles, names of customers, VAT customer numbers, and customer numbers. The software reads all PDF files that are in the folder. It then writes the recognized data into an excel file. Once the order data recognition is finished, the RPA tool opens the ERP system and uses the existing ERP device to import the order data from Excel. The ERP system then confirms the order and prints the documents (order confirmation, warehouse documents and delivery note).

It is important to note, that after the process  $\beta_2$  has been started, there is no additional human input until the end of process  $Y_2$ .

$$y_2(x, \alpha, \beta, Y, \delta, \varepsilon) = \alpha_2 + \beta_{2.1} + Y_2 + n \cdot \beta_{2.2} + \varepsilon_2 \quad (2)$$

with  $n$  = the number of articles that belong to the order and  $\varepsilon$  other time consume and  $y$  = the process time (formula developed by the author).

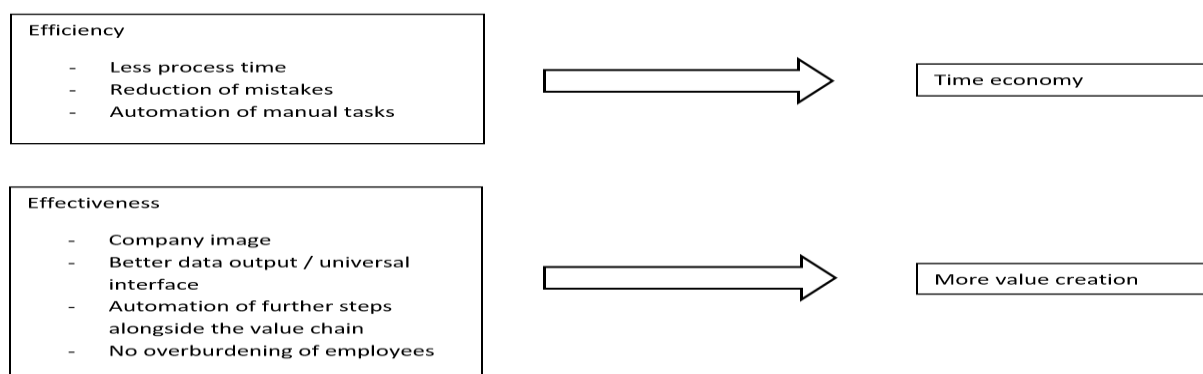
It is also important to note, that in contrast to the traditional process which treats every order separately, the new tool mainly works with a batch-working approach: When it is started, it reads all PDF files in the folder at once, and it also imports all Excel data (containing all orders of the day) into the ERP system in one step ( $Y_2$ ).

## Methods

This article explores the input of a self-developed RPA and AI tool on a SME order entry process, assuming that it would at least create a time economy of 50%. In a case study of a SME in Germany, data has been collected from daily order entry process. This objective is also a contribution to the overall understanding of how SME can enhance their digitalization profit even in an unstructured and highly individualized working context. The prerequisite situation resembles to the circumstances of the studies of Will, Campbell and Holmes (2015) and Salmen (2020). As a consequence, a similar approach has been employed to accomplish this mission. The effect of the RPA-AI tool can be measured when comparing the performance of the traditional tool with the time consume of the new RPA-AI solution. Generally, the company values the following criteria as relevant to assess the quality of the new tool: Time economy, and value creation (see figure 3). The value creation is concluded from the fact that employees would need less time for routine and standard tasks like order entry, and would instead be able to effectuate creative tasks like customer acquisition, customer service, creating orders and be involved in a continuing improvement of the company's processes and product range. Also, the automated tool would allow to unify data: In case the ERP system would be replaced in the future, the RPA process would allow to work as an interface between the customer order data, any new ERP system, and the customers' web EDI station. In the end, these flexibility-factors would also improve the company's image in the view of the customers.

The author of this work decided to measure the time economy effect because it is the most important ingredient of organizational efficiency. The value creation effects, even though its effect might be considerable, are not yet implemented, nor measurable with currently usable methods accessible to the company.

**Figure 3:** Project evaluation criteria



Source: own figure



### Data collection and sample:

The time consume for the traditional tool and the new AI application has been described in the formula in point 2.1. In order to measure this impact, a field approach similar to Will, Campbell and Holmes (2015) and Salmen (2020) has been conducted. The evaluation of time for the traditional process and the new AI application has been recorded manually on the basis of datasheets which contain the steps  $\alpha - \delta$ . The decision was to focus on representative orders which contain only one article, as they represent the majority of TKG incoming orders. Therefore, operators have been observed between February and March 2022 for the traditional tool. For the recording of the new AI application, time recording of the bot had to be effectuated also in the same period.

The traditional process could simply be measured. For the AI tool, some additional measures had to be taken as the tool runs on batch processing. Process  $\beta_2$  has been accomplished once a day. As there is a different number of orders every day, the total process time was divided through the number of daily orders to get the time per order. The same approach was used for evaluation of process  $\gamma_2$ . For process  $\alpha_2$ , only the time for saving the PDF into the folder was recorded. Time for opening the PDF from outlook and checking it, was not recorded, as this additional time has to be used as a prerequisite for the traditional process as well, and has not been counted there either.

The data was used for hypothesis testing and to measure and evaluate the results. The time needed was multiplied by the total numbers of records  $n$ , to calculate the time economy stuff saved with the new software tool. Overall, 31 results were reported.

The total time reduction ( $t$ ) per order can be expressed as

$$t = y_1 - y_2 \quad (3)$$

And the total cost savings thanks to the new tool ( $\Delta C$ )

$$\Delta C = K - n \cdot t \cdot s \quad (4)$$

where  $K$  = initial project cost,  $n$  = number of orders entered with the new AI tool during a certain period of use and  $s$  = wage cost per time unit.

Regarding the initial project cost, this position also took into account the wage cost for the intern who developed and taught the AI software and other internal costs during the development period.

The measurement was focussing on the time economy, as only this aspect could be captured reliably. Other factors were observed qualitatively and discussed in chapter 5.

The hypothesis check has been done with a non-parametric Wilcoxon test.

### 3 Methods

During February 2022 and March 2022, 31 observations were captured by the operators. Table 1 and figure 5 display the characteristics of the found data:

**Table 1:** Characteristics of the sample

	n	Ø process time	SD	skewness	kurtosis
Traditional tool	31	119.55	42.93	1.56	2.11
AI-RPA tool	31	37.94	15.86	2.09	5.02

Source: own table

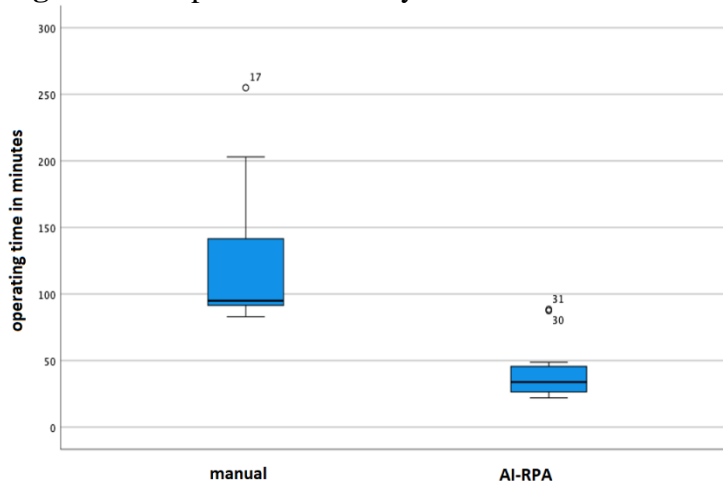
The average overall process time of the traditional tool was 119.55 seconds per order, whereas with the new AI-RPA approach, the average time consume was 37.94 seconds per order. Values

varied between 255 (observation “17”) and 83 (several observations) for the traditional tool. Many values were found around 90 seconds, showing that under normal circumstances, a process time around 90 seconds is realistic. Some runaway values were much higher, up to 255 seconds, showing operational problems (need to double-check information, open questions around the order, work disruption) which is typical for human labour and has therefore not been replaced within the sample.

The AI-RPA tool did not show this effect, and as a result, values were much closer to the average value, resulting in a much smaller standard deviation and smaller runaway values. This effect can be clearly seen in figure 4. Only observation 30 and 31 had very high runaway values, because there were only 2 imported orders for the day, so that the fix time for importing the data to the RPA tool, created a considerable extra time for every article position.

The represented phenomenon of extra time consume in relation to the normal time consume, is mirrored in the skewness and kurtosis measure, which confirms that the given distribution shows some deviations towards a standard distribution.

**Figure 4:** Boxplot of the survey data



Source: SPSS

In order to confirm the hypothesis, a non-parametric test had to be used because the data was not normally distributed (Siegel 1957). Based on a Wilcoxon-Test, the following results were found:

**Table 2:** Results of the hypothesis check

Average time economy	64.52%
p „economy >50%“	<0.001
Hedge's g	-5.6

Source: own table

The average time economy of the RPA-AI tool towards the traditional tool was 64.52%. This value was significant on the 1% level ( $p < 0.001$ ), confirming the hypothesis.

For the effect size, Hedge's g has been used, displaying a strong effect of the use of RPA-AI instead of the traditional tool (-5.6).

In order to assess the meaning of these results for the advantageousness of the RI-RPA solution, the total cost savings must be evaluated according to the procedure described in point 3. Table 3 shows that after 3 years, the project has already been paid back (total project profitability = 4.478,91€ savings).

**Table 3:** Data for advantageousness evaluation

Initial project cost	530.00	H
Initial project cost (K)	10,600.00	€
time/order traditional tool	119.55	seconds
RPA-AI tool	37.94	seconds
time economy per order (t)	81.61	seconds
number of orders/month	375	
time economy per month	30,605.44	seconds
time economy per month	8.50	Hours
wage cost/hour (s)	20.00	€
savings (€/month)	170.03	€/month
savings after 3 years ( $\Delta C$ )	4,478.91	€

Source: own table

#### 4 Discussion

The results show significant cost savings if using a combined RPA-AI approach to enter customer orders.

On the first sight, these results are in accordance with the majority of other studies that contribute strong savings of 50% and more, to RPA and AI (Chakraborti et al. 2020, Axmann and Harmoko 2021, Ribeiro et al. 2021).

But this finding must be put into the context. The time registrations have been accomplished under laboratory conditions in order to assure comparability of the results. Therefore, only orders had been used that contained one article position. Even though the majority of orders indeed only contains one article position, orders with more than one position might have a higher error rate because they are more difficult to read with OCR, due to specific design issues of the PDF. In any case, the error rate is a relevant problem because during the project, it turned out that from time to time, the software does not read the order information correctly, which might cause considerable manual work to correct and check the order data. This study has excluded the error problem, because it compares a software tool in a state when it *should* function correctly to a software tool which *already* functions correctly in order to assure comparability of the results.

However, here is a relevant difference between theory and practice, which has already been topic to scientific discussion in many places. The use of RPA is still in its infancy (Flechsigg, Anslinger and Lasch 2021). An indicator for this problem is on the one hand the fact that there are only few and expensive software tools for the current business case. Besides, high error rates are typical for new software applications. During a machine learning and neural network approach, the new software has to learn to improve its abilities and come to higher accuracy rates (Rajawat et al. 2021, Ribeiro et al. 2021). The process of machine learning puts the management of a company towards additional challenges. Several authors underline the consequences of administrative workload to surveil machine learning, which might overchallenge team members and create reluctance (Chakraborti et al. 2020, Carraro 2021).

The TKG experience mirrored the cited pros and cons which were already discussed in science. Research has revealed positive aspects of the use of RPA and AI tools, citing time reduction,

few starting investment and easy implementation (Hindel, Cabrera and Stierle 2020; Flechsig, Anslinger and Lasch 2021), but on the other hand, also the risk that the implementation is time consuming, and prone to errors (Hindel, Cabrera and Stierle 2020; Hyun et al. 2021). The fact that robots create errors leads to the fact, that human beings must control their working results after the process is finished. This leads to further weakness of RPA, because as the bots work autonomously, a process cannot be interrupted but must be improved and restarted when an error occurs, as the software bot is not aware of business contexts and other concepts of “intelligence” in order to control and scrutinize his own working results (Hindel, Cabrera and Stierle 2020). Humans are therefore needed to control the robot, and in case that the business landscape is changed, for instance due to a software update of linked software, also need to be maintained and reprogrammed. These aspects can lead to even negative time effects if RPA and AI is implemented to unsuitable processes (Geyer-Klingenberg et al. 2018, Kopeć et al. 2018). The detection and assassination of suitable processes has been topic to some more studies, (Geyer-Klingenberg et al. 2018; Kopeć et al. 2018; Beerbaum 2021; Flechsig, Anslinger and Lasch 2021), revealing the importance of that step in order to assure digitalization project success. Flechsig, Anslinger and Lasch (2021) reveal the importance of technological, organizational and organizational readiness as prerequisites for a successful implementation of AI and RPA into the company, finding that the availability of change management and communication know-how, the right partners, and skilled professionals, are critical requirements. The role of tacit knowledge in this aspect, has also been proved by other studies (van Ark 2015, Gal et al. 2019, Bettiol et al. 2020). Here, TKG and other SME, might have a disadvantage because their access to these resources is limited.

A special problem arose due to the fact, that RPA is a relatively new concept (Flechsig, Anslinger and Lasch 2021). Therefore, few software firms have the knowledge to service a newly developed RPA tool. Also, this knowledge cannot be expected within TKG or other comparable SME. Within daily operations, it is necessary to guarantee the functioning, improving and adapting of the new software tool. Costs for these processes have to be put into relation to the savings of the tool: The potential for savings is smaller, the less frequent the treated process is. That means, for SME, cost saving arguments become less important when using RPA and AI. The often-cited quality and accuracy advantage of RPA suffers from the same defects: In order to reduce errors and increase accuracy of a ML based process, many repetitions are necessary. The smaller the company is and the less repetitive its processes are, the more disadvantageous the ROI becomes.

Even though the use of AI neutralizes the requirement to have a frequently repeated and structured process, its advantages are simply limited by the fact that SME process might still lack the potential to take profit from investment into AI and RPA to optimize their administrative processes in a simple cost-saving approach.

However, taking into account other advantages of RPA and AI, their use can still be advantageous in other fields. Many authors cite possible sectors for a fruitful use of RPA and AI in banking, manufacturing and retail (Florentina 2020, Gotthardt et al. 2020, Mitra et al. 2020), or law (Glaser, Moser and Matthes 2021, Hoffmann-Riem 2022), providing many ways of using it such as data entry, automated search, product identification or data scraping (Florentina 2020). Above all, these data scraping and data analytics tools can improve the quality and efficiency of marketing decision preparation, decision taking and administration.

One additional thought should not be forgotten: Nowadays, practitioners' literature often cites a growing lack of staff in many companies due to decreasing birth rates and an aging society.

Therefore, the critical question of the future might not sound: *Does RPA and AI create savings and more process quality compared to human labour*, but: *Can RPA replace human labour to a critical extent at all, in order to replace humans when they are missing*.

Here, the results from the current TKG business case seem to suggest that RPA and AI is, in accordance with other studies, a technology that can replace human work in places that fulfil the necessary requirements: The process must be defined, enough frequent to allow machine learning, and the organizational, technical and environmental background of the project must allow a successful development and implementation.

The use of RPA and AI can also be extended to bordering processes. In the TKG business case, some customers want TKG to insert the order confirmation into a Web EDI tool. This process is now manual, but could in future be automated thanks to RPA. Due to learning curve effects, future RPA automation projects processes could reach rentability faster than early ones.

### **Conclusion**

Previous research has diagnosed a gap in understanding the role that RPA and AI play in order to contribute to the ongoing digitalization process of the business environment. Especially the question, whether RPA and AI might be useful for business cases in SME, has not been answered in science. The currently accepted state is, that RPA is a technology which is still in its infancy.

The work at hand delivers data which supports the idea that RPA together with AI might indeed be helpful also for SME in order to improve their competitiveness, linked to the advantages of these technologies: Easy to implement, no high investment, less need of repeated processes and bypassing the need for structured data.

Previous research treated advantages, disadvantages and prerequisites for the use of AI and RPA that were mainly derived from studies that were conducted in bigger companies. The characteristic advantages and disadvantages in these business cases, could also be found in the study for TKG, showing that the prerequisites for SME are comparable to bigger companies. Therefore, the advantageousness of RPA and AI can be given also for SME.

The study at hand mainly focusses on the general question, if a basis for the profitability of RPA and AI can be supposed, but it neglects the longer time horizon after the implementation phase. After the implementation, a new tool must show to be superior to a classical tool, especially taking into account maintenance expenses, error rates, eventual manual rework, and the impact on the motivation of human beings. And technology advances fast, which bears the risk of ongoing investment to keep the new tool up to date. Future investigations should be done to find out if companies can take profit from these technologies over a longer time horizon, and if its use strengthens competitiveness in the longer run.

This article also highlights typical problems of SME: less access to resources and less critical knowledge, which might in the longer run, be disadvantageous for the implementation and profit-taking from RPA and AI. It is today too early to evaluate, if these disadvantages will have a significant negative input on the performance balance of RPA and AI for SME.

### **Managerial implications**

This study is focussed on a SME business case and mainly treats questions typical for industrial SME situations. RPA and AI have been proved to be promising technologies to optimize and

automize frequent and structured processes in bigger companies, and positive results like considerably time changes, better process quality, few investment cost, easy implementation and more process accuracy have been reported already in many bigger companies' business cases.

For SME, which are subject to this study, few case studies exist, so that there is still a huge gap in understanding the input that these technologies can have to improve a SME administration. Results of this study show, that also in SME, considerably time savings can be achieved by using RPA and AI. As many data, especially orders from customers, lack a uniform data structure, AI can be a worthwhile contribution to assure a use of RPA and guarantee RPA's known advantages.

However, SME suffer from some principal weaknesses which affect the benefit from RPA and AI projects. Even though the analysed software solution is tailor made for a process which is repeated only few times and with unstructured data, the potential to take profit from RPA if the only criteria is saved time and reduced error, might disqualify many RPA and AI projects, as by nature, many SME do not have processes that are enough repetitive to create savings that justify an investment. It must be estimated, that there are ongoing costs for maintenance, reprogramming, and rechecking the process results. The necessary commitment within the implementation of RPA and AI, even though less heavy and less difficult compared to typical business automation software, is still considerable and requires a matching organizational environment.

This limit is especially an issue towards an international background. As many studies show, cultural background modifies the target, aspect and success evaluation of measures. Therefore, if organizational issues regarding a specific company culture are already a limiting factor, different cultures linked to international aspects, would even more create the need to adopt digitalization measures to the given context.

Managers of SME should therefore analyse the requirements for a successful implementation of RPA and keep in mind, that the reluctance of team members to the new technology, and an ongoing involvement into further development of the machine learning application, which requires internal and external knowledge, is required. Also, during a digitalization project with RPA and AI, the time and effort needed to make the bot enough performant to create accurate and stable results, might be underestimated. Many possible constraints occur during the project phases that might not have been seen in the beginning because they were not transparent, so that the project evaluation was too optimistic when taking an investment decision.

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