# On Application Potential of Robotic Process Automation in Small Enterprises

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#### Abstract

The potential of Robotic Process Automation (RPA) for enterprises is undisputed and includes automation of routine tasks, improvement of data quality or reduction of monotonous tasks. However, our observation from projects with enterprises is that much of this potential is clearly visible in larger enterprises but not so obvious in small enterprises. SMEs often show a lower readiness to invest time and resources in new technologies. Thus, application fields requiring an investment are not exploited by SMEs. So, what is the real application potential of RPA in SMEs? Are there typical application scenarios with potentially high benefits that SMEs should focus on? This is the focus of this paper. We will address the question of application potential primarily from a qualitative perspective, i.e. the aim is not to quantify the potential but to qualify the application fields. The contributions of this paper are (1) an innovative dataspace as an example case for business model development, (2) an approach to support business model development based on data value chains and reference enterprise architectures, and (3) analysis of existing literature in the field.

#### **Keywords**

Robot Process Automation, RPA, Small and medium-sized enterprises, SME, application potential

# 1. Introduction

Digitization and automation of processes are gaining importance and increasingly affect the competitiveness of small and medium-sized enterprises (SMEs). Process automation is an important factor in the execution of IT-supported business processes in companies in order to realize efficient as well as cost-effective business processes [2]. A frequent challenge to achieve automation is that interfaces have to be created for legacy systems or autonomously operated applications through which information can be exchanged between IT applications. However, the creation of interfaces or the reprogramming of applications leads to high IT costs, which means that automation only seems to make sense for a few central business processes [12].

For business processes that cannot be economically automated with traditional automation technologies, manual processing by humans takes place. To further reduce the manually executed business processes and to enable extensive automation in the enterprise, Robot Process Automation (RPA) technology can be used to complement traditional process automation. RPA technology automates structured and rule-based sub-processes of a business process by reproducing human actions on the user interface of an IT system through RPA software [4]. By interacting through the presentation layer of an IT system, automation with RPA can be executed without deep changes in the IT infrastructure. There are many reports on RPA use in large companies active in the banking, finance

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and insurance sectors [5], but the share in small and medium-sized companies (SMEs) is relatively low [6].

The potential of RPA for enterprises is undisputed and includes automation of routine tasks, improvement of data quality by elimination of manual entry, better work conditions for employees by reduction of monotonous tasks, and many more. However, our observation from projects with enterprises is that much of this potential is clearly visible in larger enterprises but not so obvious in small enterprises. SMEs often show a lower readiness to invest time and resources in new technologies. Thus, application fields requiring an investment, for example in APIs or training of human resources, are not exploited by SMEs. So, what is the real application potential of RPA in SMEs? Are there typical application scenarios with potentially high benefits that SMEs should focus on? This is the focus of this paper. We will address the question of application potential primarily from a qualitative perspective, i.e. the aim is not to quantify the potential but to qualify the application fields.

The contributions of this paper are (1) an innovative dataspace as an example case for business model development, (2) an approach to support business model development based on data value chains and reference enterprise architectures, and (3) analysis of existing literature in the field.

The paper is structured as follows: Section 2 introduces the research methodology used in the paper. Section 3 discusses the relevant background and related work. Section 4 identifies the functionality of RPA systems relevant for SMEs. Section 5 introduces RPA test cases composed of this functionality that are used for practical evaluation purposes of RPA tools for SMEs. Section 6 presents the results of expert interviews for evaluating practical relevance. Section 7 is dedicated to conclusions and future work.

## 2. Research Approach

The work presented in this paper is part of research aimed at a decision framework for SMEs in selecting and introducing digitalization, i.e., what technological innovations should be considered for what tasks in SMEs and what application context? The work follows the paradigm of design science research [1]. This study concerns a step towards the explication of problems and elicitation of requirements for the envisioned design artefact. The research method used is a combination of literature study, case study and argumentative-deductive work.

A literature study is conducted using a structured literature analysis for RPA in SMEs. The procedure and method are described in section 3. As a result, the literature analysis shows the current state of research on RPA in SMEs and the application scenarios observed. These application scenarios are operationalized in the next phase in order to determine the basic functions of the scenarios, the implementation of which is carried out by RPA software (Section 4). The results are then applied in the next phase by combining the basic functions into self-constructed automation scenarios. These are then implemented with an RPA tool and tested for their applicability for SMEs (Section 5). Finally, an evaluation takes place in the evaluation phase in the form of a guided interview, in which the results of the individual phases are presented to an expert and the results are classified based on their practical relevance.

### 3. Background and Related Work

### 3.1. Robotic Process Automation

The term RPA draws its origin from the techniques of scripting, macros as well as screen scraping and has been used as a term since 2013 [7]. RPA serves as a collective term for software tools that operate on a computer user interface [8] and support humans in the execution of tasks, or take over the execution of tasks completely [9]. The goal is to emulate repetitive human tasks with software that performs the same human transaction steps [10]. The emulating software is described in the definition as a script or bot, but the terms robot and software robot are also used in the literature [11].

The basic architecture of RPA is always the same in the base but can differ in the naming of components or by additional components at the different RPA vendors. Three components form the basis, which includes the development environment, the RPA robots, and a monitoring and control component [12]. Developers can automate processes in a development environment and, as a result, create an RPA robot for the automated process, which is kept in a repository. This repository can be accessed by a monitoring and control component that is responsible for executing the created RPA robots. The monitoring and control component can automatically assign tasks to a robot, which is executed on a server without human assistance. These types of robots are called "unattended robots". Alternatively, there are "attended robots", which are started by a user via the monitoring and control computer [7].

Potential application areas for RPA are workflows and processes that are highly structured and contain little variance in the flow. Furthermore, the workflows should be executed very frequently. Thus, RPA offers a similar requirement profile for processes as BPM, but processes that would be too small for BPM can be automated due to the lower automation costs [7].

## 3.2. Literature Analysis on RPA in SME

This section is intended to provide an overview of how the use of RPA in SMEs is considered in the scientific literature. The basis for this is a structured literature analysis, which is based on the recommendations of Webster and Watson [13] and Kitchenham [14]. The structured literature analysis is intended to investigate whether there is scientific work on RPA in SMEs and in which business areas RPA is applied. Furthermore, the literature analysis shall show in which concrete application scenarios RPA technology is used at SMEs. To find suitable studies for the structured literature analysis, different keywords are identified and a query is created. The query can be divided into three sections, which firstly consists of the basic topic "Robot Process Automation", secondly consists of various synonyms that cover use cases, and thirdly contains various terms to narrow down to small and medium enterprises. Consequently, no hits with the presented query were obtained in the IEEE and AISeL databases. In contrast, two conference papers were found in the Scopus database, but these do not represent relevant results. The query was therefore modified and is shown in Table 1.

#### Structure of the query

Theme	Keywords	
Basic topic	Robot Process Automation	
Use cases	case study, example, framework, rollout, application	

It can be seen that by searching in a larger query field, significantly more results were found. The summarized 166 articles from the different databases are then selected by different inclusion and exclusion criteria. Here, the inclusion criteria include a full text in English/German language, a description of an RPA application, a concrete RPA application which is described, and a lesson learning experience. The exclusion criteria include the following items: articles that report a general RPA implementation (application) but do not mention processes, RPA as a component of a program (cognitive-RPA/robotic process mining), and articles that do not focus primarily on RPA.

In summary 38 articles with 53 use cases could be identified, whereby 21 use cases were evaluated as relevant to SMEs. The results of the structured literature search are presented in Table 2 below.

### Table 2

Results of th	e structured	literature	review
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Article	Category	Application scenario	concrete example	SME suitable	RPA Software
[16]		generation of a payment document to customers	$\checkmark$	$\checkmark$	Х
[17]	Accounting	invoice processing	$\checkmark$	$\checkmark$	UiPath Studio

[18]		automation of the confirmation process	$\checkmark$	~	UiPath Studio
[19]		automatic correction of incorrect bookings	Х	$\checkmark$	Х
[20]		create sales invoices	Х	$\checkmark$	Х
[21]		posting journal entries	Х	~	Redwood Software
[22]		validation of invoice data	Х	~	Kryon Systems
[23]		preparation of tax returns	Х	$\checkmark$	Х
[24]		verification of incoming supplier invoices	Х	$\checkmark$	Х
[25]		payroll process	Х	~	Х
[19]		transfer of calculation data	Х	$\checkmark$	Х
[3]		entries in the accounting system	Х	$\checkmark$	Х
[26]		verification of double billing	Х	$\checkmark$	Claim Automation Engine
[22]		verification and validation of customer return data	Х	$\checkmark$	Kryon Systems
[19]		processing of notices	Х	$\checkmark$	Х
[27]	Distribution	send a confirmation letter to the customer	Х	~	Blue Prism Studio
[4]		updating the tax identification number	Х	~	Х
[28]	Controlling	automation of the standard cost comparison	Х	$\checkmark$	Х
[3]		creation of quantitative reports	Х	~	Х
[29]	Personal	HR data transfer	Х	~	Blue Prism Studio
[3]	Company	creation and validation of upload files	Х	~	Х

The structure of Table 2 is divided as follows. The reference for the respective article or white paper is stored in the column "Article". The specific articles can be found in the bibliography. The column "Category" divides the different application scenarios into five different business areas. The last columns include "concrete example", "SME", and "RPA Software." In the column "concrete example", the application scenarios are distinguished according to whether the scenario was described with exact and comprehensible process sections or whether it is a general description without concrete naming of process sections. Table 2 shows that concrete process sections are mentioned in only three of 21 articles. In the remaining articles, there is only a rough description of the application scenarios. The penultimate column "SME", evaluates the articles concerning their usefulness for use in SMEs. Here, 12 transferable scenarios could be identified and nine scenarios where a transfer is conceivable. In the last column of the table, the RPA software is noted if it was mentioned in the articles. In the following section, the scenarios that are relevant for SMEs are highlighted.

# 4. Required Functionality of RPA Platforms

This section examines which functions the RPA software should fulfil in order to be used in the best possible way in SMEs. For this purpose, the use cases found in the literature analysis are used. It turns out that the use cases with a concrete process description show a great many functions that an RPA software should provide. However, this only applies to three articles from the accounting category. The remaining 18 articles do not describe concrete processes, which means that only a few functions were identified for RPA software.

The identified functions from the structured literature analysis can be summarized in five upper categories. Table 3 shows which articles contain which functions. The upper categories include

interaction with another system (CRM, ERP), interaction with a browser, interaction with an email client, handling data in a program or system, and mathematical calculations. The most important category with the most features is handling data in programs or systems. Six articles indicate that the RPA software needs to read data from an external document (PDF, Excel). In addition, matching data between programs or systems are relevant for five articles. Four articles expect a function to copy and paste data, and three articles each require the functions to change the data format through a conversion, send data to a predefined user, and have data monitored. Other functions mentioned include maintaining and downloading data, moving data to another folder, posting data, updating data, saving data to a system and detecting duplicates. The second category, with four functions, is interaction with an email client. For this, an RPA software should provide functions to create as well as send an email and automatically open incoming emails and save any attachments contained in that email.

Another category with four functions is the interaction with other CRM or ERP systems. In five articles, RPA software is expected to automatically log on to a system with possibly encrypted credentials. Furthermore, four articles describe that status changes, bookings or closings should be made through the software. Other required functions include searching a system, pressing system buttons, and executing queries. In the category of interacting with a browser, three functions are required. These include logging into a web page, loading data from a web page or form, and searching as well as selecting on a web page. The last category is mathematical calculations such as determining the quantity or tax differences. In conclusion, the most common and therefore most important functions are extracting data from documents, matching data, copying and pasting data, and logging onto a system. These functions should definitely be present in an RPA software for use in small and medium-sized enterprises in order to offer great implementation potential for typical SME use cases.

#### Table 3

Required functions of RPA tools

Category	Function	Number of nominations
	read data from a document (PDF, Excel)	6
	change/convert data format	3
	send data to predefined users	3
	move data to other folders	2
	wait for files and download	1
Dealing with	book data	2
Dealing with Data	check data	3
Data	update data	2
	monitoring data	3
	save data to a system	1
	detect duplicates	1
	reconciliation of data between systems, programs	5
	copy and paste data	4
Interaction	create an email	1
with an E- Mail-Client	automatic e-mail dispatch	1
	open email	1
	save attachments of an e-mail	1
<b>T</b> ( )	logging on to a system (encrypted access data)	5
Interaction	perform a search in the system	1
with other systems (CRM, ERP)	run queries	1
	make status changes	4
	press system buttons	1
Interaction with a browser	logging in to a web page	2
	loading data from a web page	1
	search and select on a web page	1
Mathematical	price and quantity difference	1
calculations	calculation of tax differences	1

#### 5. RPA Test Case

The analysis work described in the previous sections determined applications scenarios for RPA observed in SMEs and the functions these application scenarios are composed of. The remaining part of this work will investigate to what extent RPA tools offer these functions and if SMEs consider them relevant and useful. As a means to perform this investigation, we decided to define RPA test cases that are composed of the identified functions and at the same time represent simple processes relevant to SMEs. These test cases were implemented with a selected RPA tool. The implementation afterwards was used to evaluate the relevance for SMEs in an expert interview (see Section 6). For brevity reasons, only one of the test cases is presented in this paper.

#### Test Case - Collective order

The first automation scenario deals with creating collective orders and ordering in an online store. Various employees use a program to create a shopping list of materials that they need. The program then outputs an Excel file (referred to below as an order file) containing the order number and the number of items. An employee of the purchasing department accesses these Excel files and copies all Excel files of all employees into a folder "open order". Subsequently, the co-worker in the purchasing department adds all orders together, by copying all data of the different orders into a collective order. If there are duplicate order numbers, the items are added together. The collective order concerns an Excel file (in the following collective file called), which is stored in a folder "order". If all order numbers were copied and the number of articles added, the co-worker of the purchasing department calls the side of an online Shop and looks for the individual articles based on the order numbers. If all articles are in the shopping basket, it locks the order, by registering itself with an account and placing the order.

# 6. Expert Interview

In the previous sections of this paper, different theoretical results were elaborated and the first practical experiences in implementation were gathered. This includes the operationalization of application scenarios from the literature into concrete functions, the creation of a vendor comparison based on self-selected criteria, and the implementation of automation scenarios with an RPA platform. Finally, this section attempts to classify the theoretical results through a practical evaluation. For this purpose, an interview with an industrial expert is conducted in order to obtain an assessment of the practicality of the results. For the interview, a guideline with questions in three topic blocks was prepared, which concern aspects of the company background, the automation scenarios and the development environment. The expert selected was a managing director of a company who had expressed an interest in RPA technology and who, as a managing director, could provide an assessment of the extent to which RPA technology would produce benefits and potential applications in his company. The company is an SME that operates in the electrical industry and is engaged in the manufacture of control cabinets and cable assembly. The company uses an ERP system for automation, but this system is designed for mass production, which results in a discrepancy. To close this discrepancy, various special solutions have been developed over time, which have been implemented in the form of Excel spreadsheets. This results in high use of office programs in the company and typical problems such as the non-targeted provision of documents or the back-and-forth movement of data. The company sees automation as an opportunity to increase the efficiency of its processes and minimize the typical problems of many Excel files. Next, the RPA technology, as well as architecture, was explained to the expert.

The second topic block started with a general introduction to RPA. This topic block included the automation scenarios and the identified functions from the application scenarios of the literature analysis. The identified functions from section 4 with the operationalized application scenarios from section 5 were presented to the expert and discussed. The aim was to obtain an assessment of which functions the expert felt were particularly relevant in practice. For this purpose, all functions were briefly discussed and rated as irrelevant or relevant by the expert. Various functions in the "Data handling" category turned out to be particularly relevant. In particular, reading data from documents, saving data in systems and comparing data between systems or programs were rated as significant by the expert. Other functions that are frequently used in the company include converting data, moving

data to folders, updating data, creating data and copying data. Furthermore, all functions from the category "interaction with an e-mail client" were classified as relevant. All functions from the other categories such as "interaction with other systems", "interaction with the browser" and "mathematical calculations" were rated as less relevant for the company. Functions such as sending data to predefined users, monitoring data and detecting duplicates from the "handling data" category were also rated as not relevant. It should be emphasized that the expert's functions rated as relevant from the "Handling data" category correspond to the increased number of functions mentioned in the literature. Consequently, these functions can be assessed as particularly relevant for practice.

Next, the test cases from Section 5 were explained to the expert to obtain an assessment of their practicality. In order for the expert to develop an understanding of the scenarios, the individual execution steps of the robot with programs, files and data were demonstrated and then the RPA robot was executed.

The expert assessed the first automation scenario and the extension as relevant and practical, which brings a great reduction in workload, especially for companies that have a single supplier. The expert saw difficulties for companies that purchase goods from many different suppliers, as the process must be adapted for each individual online store. Furthermore, the expert pointed out that the solution is especially helpful for online stores where item selection can only be done via the search field, which is the case with many suppliers and poses a problem. Furthermore, during the robot execution, the expert asked how the functionality of a click on a certain field works, as it brings possible errors in case of design changes on the website.

Subsequently, the expert named a sub-process for the transfer of delivery dates into an ERP system, on which the automation scenario can be transferred. Following the assessments of the practicality of the automation scenarios, the benefits of automation for sub-processes in practice were discussed. The expert sees a high benefit here for practice and in his company since a lot of information is available in different places and only needs to be compiled. This could also be programmed by a special solution with various interfaces, but the expert sees too high a cost factor in the special solutions, which is why such automation is only considered to a limited extent for his company. In RPA, the expert sees an automation solution with which small partial solutions can be created and implemented themselves, resulting in a lower cost factor for the automation. Furthermore, the interview pointed out that the automation solutions shown correspond to an attended RPA robot and not an unattended robot running in the background. However, the expert does not see any disadvantage in the attended robot compared to the unattended robot, since he sees the area of application for an unattended robot only in simple and negligible subprocesses. For important sub-processes, such as sensitive price information or the manual transfer of time recording data to the accounting department, the expert would prefer an attended robot, since the robot's process and the result can be verified by a human and a reaction can be made if errors occur. Since an unattended robot is also associated with higher costs, it would have to be examined on a case-by-case basis whether the use of an unattended robot for a subprocess makes sense or whether the short waiting time of the attended robot is acceptable.

The expert considers the automation scenarios developed from the functions to be practical, and he was able to extract aspects from the automation scenarios that can be implemented in his company. The most important aspect for the expert is the necessary increase in efficiency through RPA, which should improve the profitability of processes. If the RPA software offered a positive cost-benefit ratio, an investment of several thousand euros would be conceivable for the expert. Important criteria that the RPA provider would have to serve would be for the expert a simplified development environment for business users/citizen developers, supporting teaching content and the presence of an attended robot in the RPA software.

## 7. Summary and Conclusions

The paper investigated to what extent the aspect of RPA in SMEs can be found in science and in which application scenarios RPA is used in SMEs. Structured literature analysis revealed that no relevant articles were found with the query used and therefore a low level of research can be assumed. In the course of this, an extension of the structured literature analysis to all companies without limitation of the company size took place in order to find application scenarios that can be transferred to small

and medium-sized companies. As a result of the structured literature analysis, 38 relevant articles were identified, which contain a total of 59 application scenarios for the use of RPA in processes. In 21 of the 59 application scenarios, a transfer of sub-processes to small and medium-sized enterprises is conceivable. It should be noted that of 21 scenarios, only three scenarios contain concrete process descriptions for the use of RPA in a business process. The remaining articles only specify processes in which RPA is used without describing the integration in more detail. The findings obtained as a result of the research in this paper have shown that the use of RPA technology in SMEs is possible, although in this paper the focus was primarily on attended RPA robots, as these can also be created by business users.

With an attended RPA robot, even employees of small and medium-sized companies who do not have basic technical knowledge can develop and implement RPA implementations. An attended RPA robot primarily enables business users to automate office applications, which may be common in SMEs. For the use of unattended RPA robots in SMEs, the work shows that the creation is not suitable for the business users predominantly found in SMEs and therefore requires employees who have basic technical knowledge. Therefore, unattended RPA robots were not considered further in this work. Summarizing the use of attended RPA robots in automation scenarios, it can be said that as a quantitative benefit a significant time gain in the sub-processes, as well as a short development time to create the attended RPA robots, could be determined.

In addition, various qualitative benefits were registered such as the avoidance of processing errors and an increase in process quality. With the identification of 27 basic functions, process activities were further determined in which attended RPA robots can be used. These process activities can occur in different combinations in various sub-processes in SMEs. Through the elaborated results of this work, a recommendation for the use of RPA technology for SMEs can be given. The use of RPA makes sense in these companies if a community or free version of an RPA platform is used, as this increases the processe quality without additional costs and results in a qualitative benefit. However, only partial processes are automated by attended RPA robots, which only offer low-cost savings potential. Therefore, it can be assumed that especially in the smallest and small companies no ROI can be achieved for a purchased RPA platform. The attended RPA robot generates mainly advantages in the avoidance of processing errors and in the saving of processing time. For a high-cost savings potential to be realized, an unattended RPA robot would have to be deployed in the company, which automates entire business processes. The resulting cost savings can achieve an ROI that justifies the purchase of an RPA platform.

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