

# Success factors for RPA application in small and medium sized enterprises

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## ABSTRACT

An upcoming trend in the automation of processes in companies is the Robotic Process Automation (RPA) technology. More and more companies are starting to implement RPA, since the benefits are proven to be considerable and come quickly. However, till now most of the companies implementing and adapting to RPA are large enterprises. Small and medium-sized enterprises (SMEs) are struggling to keep up with the large enterprises in adapting RPA and sometimes even failing to adapt. In this paper, key success factors of RPA are researched based on existing literature, in which we also look at the characteristics of SMEs. Afterwards, expert interviews are utilized to validate and complete the list of key success factors found in the literature. Moreover, a case-study of an RPA implementation within an SME is performed to test the success factors. The paper concludes with a framework of key success factors for implementation of RPA in SMEs and a research agenda for further work.

## Keywords

Robotic process automation, RPA, Small and medium sized enterprises, SME, Critical success factors.

## 1. INTRODUCTION

Robotic Process Automation (RPA) is an upcoming technology in the field of automation. Repetitive administration processes which contain data collection and data processing are the most vulnerable to RPA [13]. As a result, administration processes which are normally done by staff members are the main victims of RPA. RPA focuses on repetitive, routine based tasks which are normally carried out by humans. It substitutes the average employee who works on back-office processes with a (software) robot which does the same tasks, but faster and more accurate. This creates new opportunities for the employee to focus on tasks which involve human strengths such as emotional intelligence, reasoning, judgment and personal interaction with the customer [22]. Figure 1, derived from [20], shows several characteristics of RPA to get a basic understanding of RPA. Mimics human tasks on existing applications, time-to-market within a few weeks, and no changes in your existing infrastructure are the most important characteristics in the figure.

The global spending on RPA in 2018 is estimated to have reached \$680 million, an increase 57 percent in comparison with 2017. According to Gartner, the global spending on RPA in 2022 will be \$2.4 billion. In addition, Gartner estimated that, by the end of 2018, 60 percent of organisations with a revenue of more than \$1 billion will have implemented RPA tools [19]. The growth of RPA can be explained by the quick return on investments a company can achieve when implementing it. The biggest benefit most companies thrive for is a reduction in

operational costs. Furthermore, increased efficiency, reduced error rate, and increased employee productivity are important benefits as well [9].

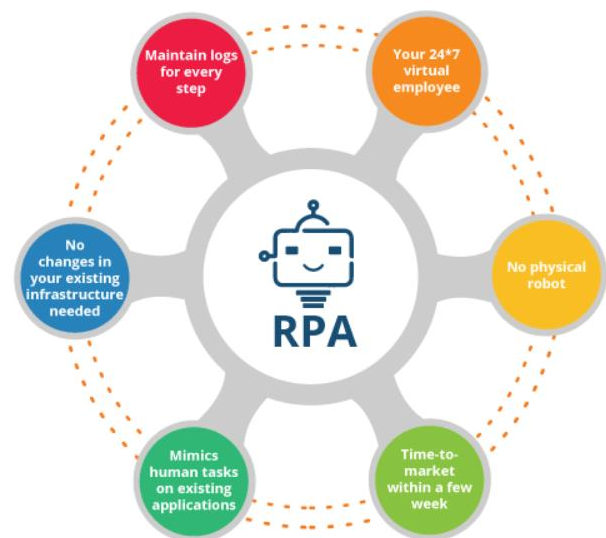


Figure 1. Several characteristics of RPA [12].

Large enterprises are the first when it comes to adapting RPA [19]. SMEs are often overlooked [14]. However, small and medium-sized enterprises (SMEs) should not be overlooked, since RPA can be beneficial to SMEs as well. When reading articles about RPA and its success factors it is often focused on large enterprises and these success factors are not all suitable for SMEs. This paper elaborates on the current state-of-the-art RPA in SMEs and discusses the important success factors of RPA explicitly for SMEs. In addition, a model of success factors of RPA for SMEs is created.

Section 2 gives a clear explanation of RPA, advantages and disadvantages of RPA, Risks of implementing RPA, and success factors of RPA. Section 3 describes the goal, problem statement and the research questions. Section 4 gives the research methods used to conduct the study. Section 5 compares SMEs and large organisations to give an overview of the differences and discusses RPA in SMEs. Section 6 details the interviews, the involved experts, followed by the results. Section 7 describes the mapping of RPA on SMEs. Section 8 discusses a case study where the success factor model is tested at recent implementations in an SME. The last section discusses the findings and presents an initial key success factor model for RPA implementation in SMEs, together with an agenda for further work.

## 2. OBJECTIVE

### 2.1 Goal

This research project aims to an increased implementation of RPA in SMEs. This research project explores the critical success factors of RPA and the objective consist of creating a list with the critical success factors of RPA for SMEs. The following two quotes emphasize the urge of my research goal: “By the end of 2022, 85 percent of large and very large organizations will have deployed some form of RPA [19].” This quote has a meaning to SMEs as well, since they cannot fall behind too far on large organisations. “Organizations that ignore this fact, do so at their own peril and will be swept away by this revolution [14].” This emphasizes the consequence of not adapting to RPA. As a result, SMEs should not ignore RPA, hence the importance of better understanding the key success factors for RPA implementation in SMEs.

### 2.2 Research questions

The main research question is:

“Under which circumstances can RPA be implemented successfully in SMEs?”

To give a correct answer to this research question, we defined the following three sub questions:

1. What are the critical success factors of RPA?
2. What are the main characteristics of SMEs?
3. What critical success factors of RPA apply to SMEs?

## 3. RESEARCH METHODS

For this research project, a multi-method research design is used:

Firstly, a literature study is done on RPA application in SMEs. As a result, the key success factors of RPA are explored and the main characteristics of a SME can be defined.

Secondly, an expert evaluation is done to receive feedback on the list of critical success factors we established. In addition, a series of interview questions were asked to four RPA experts, on their perspective on important success factors of RPA and how SMEs can adapt to RPA.

Finally, a case study is done. In this case study, key success factors of RPA will be established and compared to a SME’s characteristics. Afterwards, an evaluation of the score of this company on the success factors is done afterwards

## 4. RPA

This section explains the RPA technology. Firstly, the definitions of RPA will be discussed. Afterwards, advantages and disadvantages of RPA are given to understand its benefits and pitfalls. Furthermore, risks and success factors of implementing RPA will be explained to give a clear overview

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of how to implement RPA successfully.

### 4.1 Definitions of RPA

Most literature defines RPA with the same characteristics, but in a slightly different way. RPA is a technology, existing of software tools, that automates processes normally carried out by **humans** [7]. The (software) robot acts in **exactly the same way** as the human, so the process does not change. Because the employee is not needed to work on this process anymore he or she can focus on different tasks. This creates new opportunities for the employee to focus on tasks which involve human strengths such as emotional intelligence, reasoning, judgment and interaction with the customer [22]. In addition, Mary Lacity has conducted interviews in over 100 companies and the results showed that there was no loss in jobs, since the human talent can be redeployed to more value-added tasks [11]. However, some experts conclude that technology is growing rapidly and ask the question: “when technology can do nearly anything, what should I do, and why” which causes scepticism [18]. The processes exist of **repetitive tasks** which are **routine based**. Figure 2 displays the great potential of RPA. As showed in Figure 2, RPA allows more processes to be automated, since RPA can take over several tasks of a human worker [21].

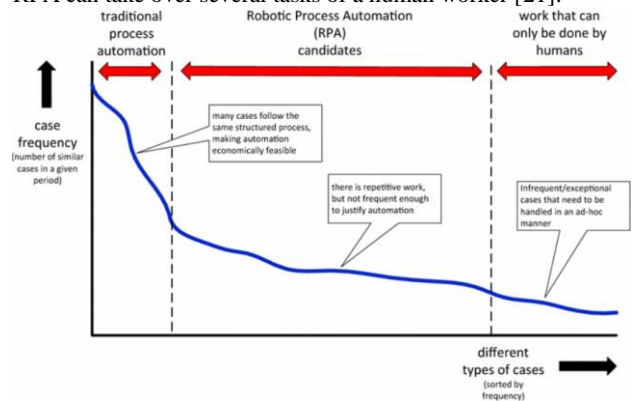


Figure 2. Processes candidating for RPA [21].

Summarising, RPA can be defined by the following three characteristics:

1. Robots take over processes formerly carried out by humans.
2. The tasks in the process do not change.
3. The tasks are repetitive and routine based.

### 4.2 RPA VS STP VS BPM

There are people who think RPA is a new technology recently developed. However, in the mid-nineties there was a hype around straight through processing (STP). This method is quite similar to RPA as it refers to processes which can be performed without human involvement [21]. STP did not turn into a big success like RPA, due to the fact that it could only handle processes on the most left side of Figure 2, since STP was not programmed in a way to handle processes by having agents that interact with different information systems as if they were human. [21]. Therefore, STP never grew into a success, but RPA did, as it is applicable to a greater amount of processes, the left an middle part of Figure 2. The two main differences between RPA and STP are [21]:

- RPA uses outside-in approach: existing information systems remain unchanged.
- When underlying information systems change RPA software should also change, just like humans do.

Business process management (BPM) is the successor of STP. Currently, BPM is still used in companies to automate processes. RPA and BPM can both automate different type of processes in a company. As a result, RPA does not replace BPM, but complements it. BPM is used on processes requiring IT expertise on IT investments such as enterprise resource planning and customer management systems [12]. The two main differences between RPA and BPM are [12]:

- RPA is easier to implement, since developers do not need advanced programming skills.
- RPA does not disturb underlying computer systems.

### 4.3 Advantages and disadvantages of RPA

RPA seems to have several advantages and especially rapid benefits such as cost reduction. However, RPA has some disadvantages as well. Therefore, this section discusses the advantages and disadvantages of RPA [1].

**Table 1. Advantages & disadvantages of RPA**

Advantages of RPA	Disadvantages of RPA
It is possible to integrate with virtually any software used by a human worker.	Currently, RPA is a temporary solution, which fills the gap between manual processes based on legacy IT systems and redesigned processes running on fully automated systems.
RPA can be implemented in a short amount of time.	RPA needs a persuasive business case to overcome caution.
Advanced programming skills are not needed.	RPA can cause tensions between management and employees, since employees can see robots as direct competition.
Employees who are replaced with RPA can be moved to more productive jobs.	Currently, RPA is only suitable for processes which are repetitive and routine based.
Benefits of RPA such as cost reduction come quickly.	RPA can cause a small loss of jobs. (can be seen as an advantage as well, since it reduces costs.)

### 4.4 Risks of implementing RPA

There are several risks when implementing RPA [5][9]:

**Identify the right processes is generalized or over-simplified:**

The biggest pitfall appears at the beginning of the RPA process. When companies want to implement RPA they first have to identify the right processes to automate. Newgensofts states that this step often is generalized or over-simplified. As a result, sometimes the wrong processes get automated and the processes which should be automated are not.

**If bot deployment is not standardized, bots could become another legacy albatross:**

Companies have to keep in mind that bots are software code and they should be treated as such. The bots should be implemented only along other technology tools that focus on reuse and abstraction. It should follow a

consistent control framework. As a result, coordination between business users, technology teams, and third-party companies will be smoothly.

**Bots might make innovation more difficult – slower:** If the system needs to be changed, for example, by the IT team performing an upgrade on the system, the IT team has to keep in mind how the bots will react to this. When this is not handled properly system innovation might be slowed down. Due to poor programming, the bot might not know that it has to stop performing in the way it did due to the upgrade. You cannot simply tell a bot to do work differently compared to a human.

**Broad deployment of bots, done too quickly, can jeopardize success:**

When just starting with implementing RPA, try to start small and do not start implementing on a broad set of processes. Focussing on too many processes can result in a significant consume of the budget of a company.

**Business-process owners have no incentive to automate themselves or their staffs out of jobs:**

Most employees who work on a process will not be the employees to try and automate is. Make sure to have the right people with the right expertise working on automating the processes.

**Bots do not eliminate the need for rethinking core platforms:**

Bots can be the solution for automating processes, but this should not mean that automating processes using bots is always the answer. Try to look at other IT solutions to improve a business.

The risks mentioned above should be taken into account if companies try to transition to RPA.

### 4.5 Success factors of RPA

To make sure an enterprise implements RPA correctly, different literature sources reported key success factors of RPA. Enterprises should have a critical look at these success factors before making the transition to RPA. In Table 1, an overview of RPA key success factors is given for enterprises in general. The left side of the table displays the key success factor and the right side displays the different sources which mention this success factor. Different colours are used to group different types of RPA success factors together. Green success factors display factors which should be taken into account before implementing the RPA process, the pre-processing part. The blue success factors should be considered during the implementation phase of RPA. These factors include mostly monitoring activities. The orange success factors include success factors about the right people and knowledge needed to successfully implement RPA. Finally, the yellow success factor consists of deals with the cost aspect of RPA.

**Table 2. Overview of RPA success factors**

RPA success factor	Source
Identify the right processes to implement RPA on.	[1][8][10][13][15][17][19][21]
Examine the possibilities of horizontal and vertical scalability.	[8][15][17][21]
Account for exceptions in the process.	[8][15][21]
Explore the different RPA implementations and identify when each implementation should be implemented.	[1][15]

Weigh in the requirements from auditing, security and compliance.	[15][17]
Keep monitoring all the RPA processes.	[1][8][15][19][21]
Measure and simulate to check if RPA improves your business performance.	[1][8][15][21]
Implementation of a center of excellence: guidelines for assessment, design, development, and deployment of robots	[8][15][17][21]
Have the right mixture of business and technology people working on your implementation of RPA	[8][17][21]
Plan change management activities	[8][17]
Have a complete business case	[15][21]

## 5. SME VS LARGE ENTERPRISES & RPA IN SMES

In this section the differences between the characteristics of SMEs and large enterprises are explained. For the research project it is important to have a clear overview of the differences of SMEs and large enterprises, as this has an influence on the key success factors belonging to only SMEs, only large enterprises, or both. Furthermore, existing literature about the implementation of RPA in SMEs is discussed.

### 5.1 SME vs large enterprises

There are several differences between SMEs and large enterprises [2]. Appendix A gives an overview of several differences between SMEs and large organisations. The table displayed in appendix A gives the differences between SMEs and large organisations in general.

### 5.2 RPA in SMEs

For a long time RPA was not lucrative for SMEs. The cost of deploying automation would not outweigh the operational and competitive benefits [16]. However, with the upcoming pay-as-you-go RPA offerings this changes. Using these offerings result in a reduction of the implementation and operating costs of RPA [16]. A study in Asia in the end of 2017 showed that 60% of SMEs in Asian regions were willing to invest in new technology over tangible assets like factories and machineries [3]. As a result, RPA might be worth considering to implement in SMEs.

The literature describes certain success factors SMEs should consider to implement RPA successfully [3][6][16][20]:

**Identify the right processes:** SMEs have a much smaller budget to work with and therefore should be extremely careful. Before implementing RPA make sure to identify the right processes suited for RPA. The tasks of the process should be rule-based, repetitive, and handles a large number of transactions.

**Explore the different RPA implementations:** There are several vendors in the RPA market offering parts of whole sets of RPA implementations. SMEs should consider if they have the right skilled people to implement RPA themselves or need external help to implement RPA successfully.

**Apply change management:** As a result of implementing RPA, certain employees do not have to take care of dull repetitive tasks. For SMEs it is hard to retain and find talented employees. By considering different tasks the employee can fulfil after the RPA implementation is done creates a higher employee morale. In addition, for SMEs the competitive edge is the superior

customer service. By freeing up space using RPA more employees can concentrate on higher value work.

**Have a complete business case:** SMEs should focus on a transformation program instead of a automation project. Since an SME has a much lower budget than large enterprises the implementation of RPA should not fail. As a result, there has to be a clear plan consisting of starting small and focusing on the right processes first before automating more than one process. All this should lead to a complete business case.

**Consider solutions which are business-friendly:** SMEs face the issue that it is much smaller than a large enterprise. Therefore, SMEs often have only a few IT specialists employed in their company. It might even be the case that a SME does not have an IT department. As a result, SMEs should consider business-friendly solutions instead of IT-intensive solutions when the required IT skill is not available. Business-friendly solutions consists of solutions which are easy to set up and easy to maintain.

## 6. EXPERT VALUATION

In this section, the goal and contents of the interview are given. Furthermore, the experts will be introduced shortly to discuss why they are an expert in the field of RPA. Finally, the results of the interview will be discussed and an expansion on table 1 will be given to clearly display the outcomes.

### 6.1 Interview

The interview is categorised as a semi-structured interview. Five open-ended questions were asked to each expert, mostly about RPA and RPA success factors. As a result, long descriptive answers were gathered and used to create a RPA success factor model only for SMEs. To make sure the idea and contents of the interview were clear an e-mail was sent two days before the actual interview with the questions of the interview together with a guide on how to answer the questions. This was needed, since some questions had to be answered before looking at the success factor model displayed in table 2, which was in the interview contents as well. As a result, bias had been prevented and the experts were well prepared for the actual interview. The goal of the interview consisted of gathering knowledge of experts about RPA and mostly about RPA success factors. Specifically, the experts were asked which RPA success factors are more significant for SMEs compared to large enterprises. In the end, the information given by the experts helped me in creating a model of success factors only for SMEs. Below the interview questions are described:

1. *What do you do in the field of RPA? In what way do you come into contact with RPA in your profession?*
2. *Before observing the model, I'm curious if you can mention RPA success factors of RPA when implementing it in a company. According to you, what are the success factors that are required to implement RPA in a company?*
3. *To continue on question 2, which of these success factors have more influence on a small to medium sized enterprise (SME) than on a large enterprise?*
4. *After observing the model, do you think this model is complete? Do you think success factors for implementing RPA in a company are missing?*
5. *According to you, which of these success factors have more influence on a small to medium sized enterprise (SME) than on a large enterprise?*



The model mentioned in the interview questions refers to the model displayed in table 2. The answers to the question described above can be found in the following two subsections.

## 6.2 Experts

Four experts have been interviewed. In this section, the experts are introduced and a description is given of how they come across RPA in their daily life.

**Jean Paul Sebastian Piest:** Sebastian is currently doing PhD research within the TKI Dinalog project Autonomous Logistics Miners for Small & Medium sized Businesses. Within this project he is doing research into data mining, RPA, and artificial intelligence. In addition, he was also involved with the implementation of RPA at one of the consortium partners, logistics chain director Kien Logistics Management. Before this, he worked in IT for more than eight years and supervised various RPA cases in logistics.

**Bart van Nunen:** Bart is a contract manager at CGI. He helps clients to get more financial gains in companies and tackles the question: How can I get better financially as a company. This is done by looking at the back office of a company and considering if processes can be automated using RPA, for example, invoice processes. To convince clients of the benefits of RPA Bart compiles proof of concepts with all the advantages of RPA, since SMEs do not always see the benefits of RPA. Last year, Bart worked as a contract manager in several RPA implementation projects. In addition, Bart was part of a success trajectory in Spain implementing RPA in the processes of an energy supplier.

**Ruben Velstra:** Ruben works externally at the Volksbank. His profession consists of working as a consultant or product owner. His current role is program manager and he focuses on customer integrity. The processes he comes across involve a considerable amount of manual labour, consisting of repetitive tasks. An external party is implementing RPA in these processes and Ruben is the client. Ruben has been part of several RPA projects as a product owner or consult in the last few years.

**Robert-Jan Hengstmangers:** Robert-Jan is working in the consultancy in the field of RPA. He focuses on consultancy of RPA for SMEs. Most SMEs do not have the right person to lead and Robert-Jan gives these companies advice on how to tackle implementing RPA. Robert-Jan started working in the field of RPA in 2016. Robert-Jan has been part of several RPA implementation projects by giving consultancy about how to implement RPA.

## 6.3 Interview results

Five questions were asked during the interview. An overview of the RPA success factors and the results of the interview are shown in table 3. The first column of the table displays the key success factors of RPA. The second column displays the answer of the experts on question two of the interview. Thus, when the name of an expert is filled in this means the expert mentioned this success factor of RPA before observing the model given in the interview which corresponds with table 2. Finally, the third column of the table displays the answer to question three and five of the interview. Therefore, when the name of an expert is filled in this means the expert finds the corresponding success factor of RPA more important for SMEs.

**Table 3. An overview of RPA success factors corresponding the results of the interview.**

RPA successfactor	Mentioned	Specifically for SMEs
Identify the right processes to implement RPA on.	Sebastian, Bart, Ruben, Robert-Jan	Sebastian, Bart, Ruben, Robert-Jan
Examine the possibilities of horizontal and vertical scalability.	Sebastian, Ruben	
Account for exceptions in the process.	Sebastian, Robert-Jan	
Explore the different RPA implementations and identify when each implementation should be implemented.	Sebastian, Bart, Ruben, Robert-Jan	Sebastian, Bart, Ruben, Robert-Jan
Weigh in the requirements from auditing, security and compliance.		
Keep monitoring all the RPA processes.	Sebastian	Sebastian, Bart, Ruben, Robert-Jan
Measure and simulate to check if RPA improves your business performance.	Sebastian	Sebastian, Bart, Ruben, Robert-Jan
Implementation of a center of excellence: guidelines for assessment, design, development, and deployment of robots		
Have the right mixture of business and technology people working on your implementation of RPA	Sebastian, Ruben, Robert-Jan	Sebastian, Ruben, Robert-Jan
Plan change management activities	Bart, Robert-Jan	Sebastian, Bart, Robert-Jan
Have a complete business case	Sebastian, Ruben, Robert-Jan	Sebastian, Bart, Ruben, Robert-Jan

In addition, the experts answered question four which resulted in important findings which could not be displayed in table 3.

Ruben Velstra mentioned that the success factors of RPA might differ, since there are two different parties selling RPA implementations. Firstly, there are the parties who sell parts of a RPA implementation, such as Covax. The buying company has to build the full implementation themselves. As a result, highly skilled IT people in the field of RPA are needed. Secondly, there are parties who build the entire RPA implementation from scratch, such as Bluepond. As a result, highly skilled IT people are not needed for the implementation.

According to Bart van Nunen and Robert-Jan Hengstmangers, SMEs are stubborn to see the advantages of RPA. To convince SMEs of the advantages one should just start implementing it and start small. Start automating one process using RPA and afterwards present the benefits gained to the SME. As a result, the SME will slowly start seeing the importance of RPA. Furthermore, Bart and Robert-Jan mentioned that RPA creates different opportunities and jobs and does not necessarily take these away. Before implementing RPA, SMEs should carefully think about what happens to the employees after the implementation of RPA is done. By setting up a clear plan employees do not feel scared to lose their jobs, but have a certainty of doing different work. This helps to convince an SME to implement RPA as well. This is only the case if the company has as goal to grow their business and increase their productivity. However, if the goal of the company is just automating processes and decreasing costs, new jobs and opportunities will not be created an jobs will be lost.

Finally, Jean Paul Sebastian Piest mentioned that the model of key success factors of RPA is quite complete. However, the business case success factor can be split up into one-off investments and recurring costs, so that Capital expenditures (CAPEX) and operating expenses (OPEX) are explicit. In addition, the knowledge of the benefits and risks of implementing RPA could be added to the business case success factor.

## 7. MAPPING RPA ON SMES

In this section, a model is created of RPA success factors for SMEs according to the literature and the results of the expert valuation. The model is displayed below

**Table 4. An overview of RPA success factors for SMEs**

RPA success factor SME
Identify the right processes to implement RPA on.
Explore the different RPA implementations and identify when each implementation should be implemented.
Keep monitoring all the RPA processes.
Measure and simulate to check if RPA improves your business performance.
Have the right mixture of business and technology people working on your implementation of RPA.
Plan change management activities.
Have a complete business case, determine the CAPEX/OPEX, and consider the benefits and risks of RPA.

The key success factors of RPA for SMEs, displayed in table 4, have been explained in section 5.2 and 6.3. According to the interview results and the literature these are the most important success factors of RPA for SMEs. Following these success

factors should lead to a successful implementation of RPA in SMEs.

## 8. USE CASE: CTT

This section discusses the Combi Terminal Twente (CTT) case. Firstly, a short introduction of CTT and the objective of the use case are given. Afterwards, the results of the use case are discussed.

### 8.1 Case description

CTT is a logistic company which transports loads through truck, barge, and train. CTT is a SME with approximately 35 employees which is slowly making the transition to automating processes. The IT staff has made several 'hamsters' which are robots which take care of some processes. The author of this paper worked together with two other students on automating one certain process. This process consisted of receiving an e-mail with the question of a customer about the estimated time of arrival (ETA) of their container. The robot would search the database to get the corresponding ETA of the container of the client and compose an e-mail with an accurate reaction. The customer service agent checks the composed e-mail and afterwards approves or disapproves. When approved the robot would sent the e-mail with the correct ETA of the container to the client.

In this case, table 4 will be compared to the environment of CTT. Since they already started applying RPA in their company they can check if there environment supports this transition they are slowly making. In the end, advice will be given according to sufficiency rate of the CTT environment on the RPA success factor model for SMEs.

### 8.2 Case results

To check if CTT meets the success factors of RPA for SMEs, the framework of table 4 will be compared to their environment. The results are shown below. Answers are given from the perspective of the author of this paper who worked at CTT for an automation project and the perspective of the operational manager of CTT, Danny Otter.

**Identify the right processes to implement RPA on:** Before automating a process the customer service of CTT was asked questions to identify processes which were repetitive and routine based. The customer service agents were asked how often a certain question was asked every day or week and if there occurred errors during the process and how often. Afterwards, customer service agents were observed on how they executed these processes and how long it took to perform these processes. As a result, the duration of the process was determined and compared to the duration of the process when it was automated. Therefore, an attempt on identifying the right processes to implement RPA on was done.

**Explore the different RPA implementations and identify when each implementation should be implemented:** CTT has chosen Microsoft Flow to automate processes in their company. This decision is made, since the company had chosen to work in a Microsoft Azure environment. Before making this decision Danny explored other environments, but the Microsoft Azure environment suited their company the best. Therefore, the decision to implement RPA with Microsoft Flow is well thought out and other RPA implementations were considered.

**Keep monitoring all the RPA processes:** CTT keeps track of the performance of their 'hamsters'. It has developed a dashboard to see how many processes a certain 'hamster' has

taken care of and what the results were. In addition, CTT keeps track of the failures which are reported clearly, so it can be solved easily.

**Measure and simulate to check if RPA improves your business performance:** As described above, CTT monitors all the processes which are automated using RPA. Some results can be used to determine if RPA improves business performance or not. According to Danny, 2 fte has already been saved using the ‘hamsters’ in action. Therefore, CTT satisfies this success factor.

**Have the right mixture of business and technology people working on your implementation of RPA:** Currently, there are working two people on the automation of processes at CTT. One business & IT employee and one employee with the knowledge of IT. Therefore, a mixture of business and technology people are present. However, CTT should consider adding more employees with the knowledge of IT or school their current employees to get knowledge about RPA to get the automation of processes of the ground.

**Plan change management activities:** CTT plans change management activities. Before automating the processes it first looks into the possibilities the automation creates for employees when they are not fully needed anymore in the process they are currently working on, due to the automation of it. As a result, the employees are less sceptical about the transition to automation.

**Have a complete business case, determine the CAPEX/OPEX, and consider the benefits and risks of RPA:** CTT did never create a complete business case, since they are still in the exploring phase. However, Danny stated that the definitions, risks, and benefits of RPA have been researched carefully before starting to implement it. CTT started with small ‘hamsters’ and afterwards asked a group of students, including me, to try and automate a certain process and give advice to CTT for the future. Now, they are looking into more options and a more advanced plan. However, Danny stated that a business case is not needed anymore, since the company was already benefiting from RPA.

As described above, CTT complies to the first, second, third, fourth, and sixth success factor of RPA. The fifth success factor is partly true for CTT, since they have a business and a technology employee working on automation. However, CTT should consider adding a few more employees to this. CTT does not comply to seventh success factor of RPA.

It can be concluded that CTT is on the right way to make the transition to RPA and might in the future consider implementing RPA on a larger scale as they are doing now. However, since the fifth success factor is missing, CTT should consider recruiting additional employees with the knowledge of IT or schooling current employees to get them involved in the RPA implementations. In addition, the seventh factor about a complete business case is missing. Danny stated that a complete business case is not necessary, but CTT should be careful to not miss out due to not having a complete business case.

## 9. CONCLUSION & DISCUSSION

In this paper, a framework of success factors of RPA for SMEs is established to help SMEs in the transition to RPA. The framework consists of seven success factors which should all be considered when an SME considers implementing RPA. The seven success factors are grouped into four different types of success factors. Green success factors should be considered before implementing RPA. Blue success factors should be

considered during the implementation of RPA. Orange success factors involve the employees, their skill and opportunities. Finally, the yellow success factor involves the cost part.

One main research question was stated split into three sub-questions. First, the three sub-questions are answered. The first sub-question is: “1. What are the critical success factors of RPA?” To answer this question literature study is done on the success factors of RPA for SMEs and for large enterprises. Afterwards, an overview of all the success factors of RPA has been composed and can be seen in Table 2.

The second sub-question is: “What are the main characteristics of SMEs?” This question is answered by doing a literature study on the characteristics of SMEs. In addition, the characteristics of SMEs and large enterprises are compared to see the differences. The results are discussed in section 5 and can be seen Appendix A.

The third sub-question is: “What critical success factors of RPA apply to SMEs?” To answer this question a literature study is done on success factors of RPA for SMEs and an expert evaluation is conducted. The results of the expert evaluation can be read in section 6 and be seen in Table 3. Eventually, the success factors of RPA for SMEs are shown in Table 4.

The main question of our research is: “Under which circumstances can RPA be implemented successfully in SMEs?” Answering the three sub-questions result in an answer to the main question. The literature study and expert evaluation lead to the framework of success factors of RPA for SMEs, as can be seen in Table 4. The framework is tested in a case study at CTT, a SME. This is only one SME which makes it difficult to generalize the findings. An SME can use this framework to test if the company is ready for a transition to RPA. When a company complies to most success factors of RPA for SMEs the company has a high chance of being successful making the transition.

In the future, the model should be expanded by applying scales and scores to it. As a result, the importance of each success factor can be determined. Due to the limited time span for this research project this was not feasible. In addition, the framework should be tested by applying it to more SMEs. SMEs which are already implementing RPA should test the framework to check if it is correct. Moreover, SMEs which are not yet implementing RPA should consider using the framework and check if they are successful when using it. As a result, different success factors could appear and exceptions could occur and result in new findings.

In addition, bringing in more RPA implementation expertise should be considered. Only four experts are interviewed about their knowledge of RPA, but asking twenty other experts in the field of RPA could lead to new insights and findings.

Furthermore, it should be further explored which design attention points there are for SMEs and which ones should be followed. Should an SME just start implementing RPA in a few processes like CTT or should an SME think about automating small parts of processes which can be reused in different processes? These different design attention points of SMEs should be considered. This is important, as an SME has a totally different IT organisation within their company compared to large organisations.

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## APPENDIX

### A. Differences between SMEs & large enterprises

Table 2. A comparison between the characteristics of large, medium and small organizations

Large organizations	Small and medium organizations
Hierarchical with several layers of management	Flat with very few layers of management
Clear and extensive functional division of activities. High degree of specialization.	Division of activities limited and unclear. Low degree of specialization
Strong departmental/functional mind set	Absence of departmental/functional mind set. Corporate mind-set
Activities and operations governed by formal rules and procedures.	Activities and operations not governed by formal rules and procedures.
High degree of standardization and formalization	Low degree of standardization and formalization
Mostly bureaucratic	Mostly organic
Extended decision-making chain	Short decision-making chain
Top management a long distance away from the point of delivery	Top management close to the point of delivery
Top management's visibility limited	Top management highly visible
Wide span of activities	Span of activities narrow
Multi-sited and possibly multinational	Single-sited
Cultural diversity	Unified culture
System dominated	People dominated
Cultural inertia	Fluid culture
Rigid organization and flows	Flexible organization and flows
Many interest groups	Very few interest groups
Incidence of fact-based decision-making more prevalent	Incidence of 'gut feeling' decisions more prevalent
Dominated by professionals and technocrats	Dominated by pioneers and entrepreneurs
Range of management styles: directive; participative; paternal; etc.	Range of management styles: directive; paternal
Meritocratic	Patronage
Individuals normally cannot see the results of their endeavours	Individuals normally can see the results of their endeavours
Ample human capital, financial resources and know-how	Modest human capital, financial resources and know-how
Training and staff development is more likely to be planned and large scale	Training and staff development is more likely to be ad hoc and small scale
Specified training budget	No specified training budget
Extensive external contacts	Limited external contacts
High incidence of unionization	Low incidence of unionization
Normally slow response to environmental changes	Normally rapid response to environmental changes
High degree of resistance to change	Negligible resistance to change
Potentially many internal change catalysts	Very few internal change catalysts
Low incidence of innovativeness	High incidence of innovativeness
Formal evaluation, control and reporting procedures	Informal evaluation, control and reporting procedures
Control oriented	Result oriented
Rigid corporate culture dominating operations and behaviours	Operations and behaviour of employees influenced by owners'/managers' ethos and outlook