International Group of Controlling

STUDY REPORT

ROBOTIC PROCESS AUTOMATION IN CONTROLLING - RESULTS OF AN EMPIRICAL STUDY

Imprint

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MANAGEMENT SUMMARY

This study sets out to explore Robotic Process Automation (RPA), specifically in Controlling processes' contexts with the help of interviews among experts from major consulting firms. RPA means automation of processes by software robots that mimic human interaction with computer and software. Among many vendors of commercial RPA applications, three are consistently marked as market leaders: UiPath, Automation Anywhere and BluePrism. With the help of these solutions, RPA-pioneer companies are successfully leveraging cost and quality potentials.

Realistic use cases range from reception of mail and extraction of mail attachments to more complicated and sophisticated processes that adhere to pre-defined decision rules. However, many clients seem to underestimate risks and efforts necessary to maintain established RPA solutions, and overestimate potentials for headcount reduction. Reasons for underperforming RPA initiatives are poor data quality and high degrees of variation of processes.

Among the IGC's Process Model of Controlling processes, (management) reporting processes have the most extensive automation potential. Data maintenance processes also prove to benefit from RPA considerably. In these process areas, companies begin RPA pilot projects that should deliver relevant results already after two months. They should not forget alignment with IT departments and budget for ongoing maintenance, however. Organically growing RPA landscapes can imply operational risks.

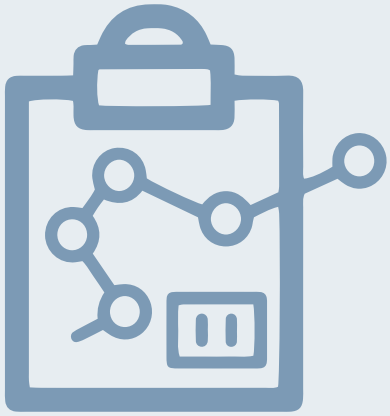
More advanced companies take the concept further by establishing shared service centers for process automation. They need to build up competencies that combine process, controlling and IT skills, either in teams or individuals, which are not always easy to obtain.

Companies that want to explore their own potential for RPA should start experimenting, consider sourcing or building up central-for-decentral expertise, optimize data quality and minimize process variability. If this is no new advice, maybe the potential that RPA is pretending to have may also convince companies to invest into optimization first before considering automation.

CONTENTS

INTRODUCTION

Robotic Process Automation (RPA) *has been marketed throughout the past years as a large lever for efficiency improvements in various corporate functions, including Controlling. Prior studies have identified processes in Controlling that display high potential for automation due to the nature of their inherent tasks. Despite the fact, that there are major players in the market that already offer powerful applications, only limited use of RPA in practice can be observed so far. It might be possible, that the use of RPA in Controlling is heavily dependent on know-how and available skill-sets as well as knowledge of already existing RPA use cases. It is necessary to understand the technology and the underlying capabilities in more detail. This study report provides support in this respect. Additionally, it offers the readers the opportunity to find their own answer to the question whether RPA is just hype or a promising novel solution with long-term success potential.*



2 STUDY BACKGROUND

2.1 STUDY OBJECTIVES

This study aims to add to the existing knowledge regarding the use of RPA in the Controlling function. This is to be achieved through empirical research, following a qualitative research design based on expert interviews. The following research questions will be addressed:

1. *What potential does RPA offer for companies in general and for Controlling in particular?*
2. *What kind of competencies are needed to master and use RPA?*
3. *Which RPA technologies or software solutions can be used for the implementation?*
4. *What kind of concrete examples of implementation (use cases) can already be identified?*
5. *Which processes of the IGC Controlling Process Model 2.0 are best suited for the application of RPA?*
6. *What kind of efficiency gains in terms of cost and time can in general be expected by the use of RPA?*
7. *What development can be expected in the next three to five years?*

Thus, the study provides valuable insights into the practical application of RPA in Controlling.

2.2 STUDY APPROACH

Initially, we conducted a brief literature review, attempting to identify pieces of literature that specifically deal with RPA in Controlling contexts. We focused mainly on academic and practice-oriented publications as well as existing study reports in English and German language, which have been published after 2015. For our research, we made use of various different online databases, including Google Scholar, to identify relevant publications. In addition, we searched the Internet for other resources, like presentations, videos, tutorials etc. that helped us outline a comprehensive overview on the relevant software solutions market, active vendors, available tools, etc. A link list with useful web content on RPA is presented in Annex 2.

For the empirical study an exploratory, qualitative research design was adopted. We used semi-structured expert interviews, as these are the most useful approach for investigating opinions and complex issues. An interview guide was developed and pre-tested, which organized questions in an easy-to-follow structure for the interviewees. Finally, the interview guide composed of seven different sections containing in total about 35 open-ended questions (see Annex 1).

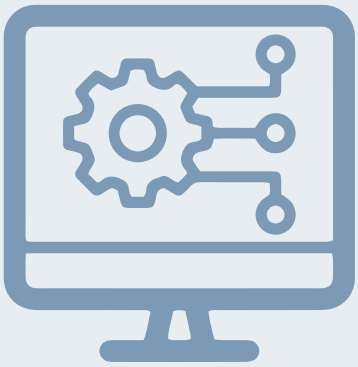
Our sampling strategy focused exclusively on consulting companies that are offering RPA services in their portfolio. This selection resulted from the consideration that especially large consulting companies should be able to provide insights regarding latest implementation practices. In total six interviews with seven experts were conducted via phone or video conferences between March and April 2020. The average length of the individual interviews was about one hour. Table 1 provides an overview on the participating companies and the position of the interviewees.

The experience and knowledge background of the interviewees was rather homogeneous. All participants judged themselves to be “advanced” or “experts” in the field of RPA. Almost all respondents were already involved in implementation projects in the context of RPA. However, only a minority has actually done extended implementation work personally and considered themselves to be “tech savvy”. Rather, the majority has been responsible for sales activities and project coordination. Roughly half of the interviewees have a stronger background in process optimization in general, while the other half has a strong background in Finance/Accounting/Controlling subjects and incorporated a detailed user perspective.

All interviews were recorded and transcribed. At the end, more than 100 pages of transcribed interviews were jointly analyzed in an iterative process.

Table 1: Sample of companies and interviewees

Company	Sector	Interviewees
Horváth & Partners	Consulting	Principal
BearingPoint	Consulting	Partner (2x)
Ernst & Young	Consulting	Managing Director
KPMG	Consulting	Senior Manager
PricewaterhouseCoopers	Consulting	Senior Manager (2x)



3 RESULTS OF THE LITERATURE AND THE INTERNET SEARCH

3.1 OVERVIEW ON EXISTING PUBLICATIONS

Scientific as well as practice-oriented publications on RPA mainly cover introductory articles and books which explain the technology, distinguish it from other technologies and specify possible applications and potentials. This is supplemented by individual case studies, where specific drivers and barriers as well as the implementation process are reviewed, and expert interviews.

As one of the early groundbreaking case studies, Lacity and Willcocks (2016) explain the use of RPA at Telefónica O2. They cover a wide range of relevant questions regarding the technology and provide valuable initial practical experience and benchmarks. They also list twelve other companies that have already implemented RPA, however, without carrying out specific studies on these use cases. Willcocks et al. (2017) provide additional guidance and practical recommendations based on another case study of the company Xchanging. In particular, a meaningful process for an RPA implementation is outlined in that article. Cooper et al. (2019) investigate the implementation of RPA software in public accounting by interviewing RPA leaders at Big 4 companies. Radke et al. (2020) as one other example demonstrate the potential benefits of applying RPA technology in master data management based on two companies in the manufacturing industry.

In summary, the available literature in the field of RPA in general is relatively limited in terms of both quantity and coverage. This limitation is even more valid when it comes to the specific context of RPA in Controlling.

LISTING 1: LIST OF IDENTIFIED PUBLICATIONS

Aalst, W. M. P. van der/Bichler, D./ Heinzl, A. (2018)
Robotic Process Automation, in: Business & Information Systems Engineering, *60 (4), pp. 269-272.*

Alexander, S./Haisermann, A./Schabicki, T./ Frank, S. (2018)
Robotic Process Automation (RPA) im Rechnungswesen und Controlling – welche Chancen ergeben sich?, in: Controlling – Zeitschrift für erfolgsorientierte Unternehmenssteuerung, *30 (3), pp. 11-19.*

Camin, T. (2018)
Roboter im Shared Service Center, in: Controlling & Management Review, *62 (8), pp. 30-37.*

Cooper, L. A./Holderness, D. K./ Sorensen, T. L./Wood, D. A. (2019)
Robotic Process Automation in Public Accounting, in: Accounting Horizons, *33 (4), pp. 15-35.*

Czarnecki C./ Auth, G. (2018)
Prozessdigitalisierung durch Robotic Process Automation, in: Barton T./ Müller, C./ Seel, C. (Eds.). Digitalisierung in Unternehmen – Von den theoretischen Ansätzen zur praktischen Umsetzung, *pp. 113-132, Springer Vieweg: Wiesbaden.*

Hermann, K./Stoi, R./Wolf, B. (2018)
Robotic Process Automation im Finance & Controlling der Mann + Hummel Gruppe, in: Controlling – Zeitschrift für erfolgsorientierte Unternehmenssteuerung, *30 (3), pp. 28-34.*

Isensee J./Ostrowicz, S./ Reuschenbach, D. (2018)
RPA im Controlling – Steigerung der Effizienz im Reporting durch Robotic Process Automation. Retrieved on 20.02.2020, from *https://www.horvath-partners.com/de/media-center/white-paper/rpa-im-controlling/*

Kleehaupt-Roither, B./Unger, T. (2018)
Von RPA-Mythen zur Automatisierungsstrategie, in: Controlling & Management Review, *62 (8), pp. 49-58.*

Lacity, M./Willcocks, L. (2016)
Robotic Process Automation at Telefónica O2, in: MIS Quarterly Executive, *15 (1), pp. 21-35.*

Langmann, C./Turi, D. (2020)
Robotic Process Automation (RPA) – Digitalisierung und Automatisierung von Prozessen, Voraussetzungen, Funktionsweise und Implementierung am Beispiel des Controllings und Rechnungswesens, *Springer Fachmedien: Wiesbaden.*

Metz, M./Suffa, S. G. (2018)
Die schöne neue Welt des Controllings, in: Controlling & Management Review, *62 (8), pp. 8-15.*

Mei Ying, L. (2018)
Robotic Process Automation with Blue Prism Quick Start Guide: Create Software Robots and Automate Business Processes, *Packt Publishing: Birmingham.*

Osman, C.-C. (2019)
Robotic Process Automation: Lessons Learned from Case Studies, in: Informatica Economică, *23 (4), pp. 66-75.*

Radke, A. M./Dang, M. T./Tan, A. (2020)
Using Robotic Process Automation (RPA) To Enhance Item Master Data Maintenance Process, in: LogForum, *16 (1), pp. 129-140.*

Schmitz, M./Dietze, C./Czarnecki, C. (2019)
Enabling Digital Transformation Through Robotic Process Automation at Deutsche Telekom, in: Urbach, N./Röglinger, M. (Eds.) Digitalization Cases, *pp. 15-33, Springer International Publishing: Cham.*

Singh, M. (2018)
Wenn Roboter zu Bankern werden, in: Controlling & Management Review, *62 (8), pp. 38-47.*

Smeets, M./Erhard, R./Kaußler, T. (2019)
Robotic Process Automation (RPA) in der Finanzwirtschaft Technologie – Implementierung – Erfolgsfaktoren für Entscheider und Anwender, *Springer Fachmedien: Wiesbaden.*

Tripathi, A. M. (2018)
Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with the Leading RPA Tool - Uipath, *Packt Publishing: Birmingham.*

Weber, J. (2018)
Robotics wird so selbstverständlich sein wie Elektrizität – Interview mit Marcus Kuhnert (CFO Merck), in: Controlling & Management Review, *62 (8), pp. 24-29.*

Willcocks, L./Lacity, M. (2016)
Service automation – Robots and the future of work, Steve Brooks, *Publishing: Warwickshire.*

Willcocks, L./Lacity, M./Craig, A. (2017)
Robotic process automation: strategic transformation I ever for global business services?, in: Journal of Information Technology Teaching, *Cases, 7, pp. 17-28.*

The studies conducted by consultancies and software developers suggest, that the benefits seen by companies which already have used RPA as technology are cost reduction, decreased processing times and increased quality, increased customer satisfaction as well as insourcing. They conclude that companies are aware in general of the importance of RPA and predict that it will become more important in the future. The consensus within the studies so far is that the real usage is still expandable, but many companies are planning to invest into it. However, some studies lack transparency as the methodology used is not always explained in detail or underlying premises are not outlined. Nevertheless they provide relevant statements for practice and starting points for further research.

For example a study by Horváth and Partners (2017) shows that more than half of the companies surveyed are using RPA in specific areas, running pilot projects or at least planning to use this technology. Two thirds of the respondents consider the use of robotics to be important, but see RPA more as a bridging technology. Automation potentials are mostly seen in repetitive, rule-based processes within different systems that are standardized and performed in a high volume using structured data as input. Nevertheless, as the number of those processes in Controlling is considered to be limited, it might be the reason why the potentials of RPA are not perceived as high as in other corporate functions *(Horváth & Partners, 2017, pp. 11-21).*

The planning of RPA implementation is also observed in a study by Lünendonk & Hossenfelder (2019). More than a third of the surveyed companies use RPA tools, whereas only 15% do not plan any use of RPA. Potential is also seen in efficiency and cost optimization, productivity gains and reduction of errors. Processes are expected to become faster and with higher quality outcomes. The study furthermore shows that the potential of automation is increased when RPA is combined with artificial intelligence (AI). Use cases in Finance and Controlling are already implemented for management reporting and data integration. The major hindering factors within companies are lacking process definitions and caveats in the works council. Nevertheless, RPA seems to be a solution for automation for many companies *(Lünendonk & Hossenfelder, 2019, p. 4).*

A study of Warth & Klein Grant Thornton in collaboration with the University of Applied Sciences Ruhr West showed similar results. The companies are aware of digitalization and preparing for it. Smaller companies are lacking reliable digitalization strategies, however. The respondents see application potential of RPA in Controlling in monitoring and management reporting. The main obstacles for the introduction of new technologies like RPA are the lack of know-how and the willingness to change within the companies *(Warth & Klein Grant Thornton, 2019, p. 2).*

Software developer Diamant (2020) notes an increased need for automation, but although the importance seems to be clear in corporate practice, the actual use is largely lacking behind. Currently, potentials are revealed by taking over routine tasks, which results in an increase of productivity, better results and quality and decision-making support. Controlling in their study is seen as the number one winner of automation. While currently Excel is still the most used tool, automation is catching up. It is expected that by making increased use of automation the role of the Controller can develop even more clearly into that of a business partner for the management *(Diamant Software, 2020, pp. 5-28).*

LISTING 2: LIST OF IDENTIFIED STUDY REPORTS

Capgemini Consulting (2016)
Robotic Process Automation – Robots conquer business processes in back office. Retrieved on 20.02.2020, from *https://www.capgemini.com/consulting-de/wp-content/uploads/sites/32/2017/08/robotic-process-automation-study.pdf*

Deloitte (2017a)
Robotic Process Automation in FSI. Retrieved on 20.02.2020 from *https://www2.deloitte.com/content/dam/Deloitte/de/Documents/financial-services/20171127_Robotics%20Event_Transscript%20(003).pdf*

Deloitte (2017b)
The robots are ready. Are you? Retrieved on 20.02.2020, from *https://www2.deloitte.com/content/dam/Deloitte/tr/Documents/technology/deloitte-robots-are-ready.pdf*

Diamant Software (2020)
Wer wollen wir sein? Der kaufmännische Bereich erfindet sich neu. Retrieved on 20.02.2020, from *https://www.diamant-software.de/studie-kuenstliche-intelligenz-rechnungswesen/*

Horváth & Partners (2017)
Einsatz von Robotics in der Finanzindustrie. Retrieved on 20.02.2020, from *https://www.horvath-partners.com/fileadmin/horvath-partners.com/assets/05_Media_Center/PDFs/Studien-PDFs_fuer_MAT-Download/20170328_Blitzumfrage_Robotics_in_FI_deutsch_g.pdf*

Horváth & Partners (2018)
Next Generation Process Automation: Integrierte Prozessautomation im Zeitalter der Digitalisierung, *Ergebnisbericht Studie 2018.*

IDG Business Media GmbH/Blue Reply GmbH (2019)
Studie Process Mining & RPA 2019 – Die wichtigsten Ergebnisse. Retrieved on 20.02.2020, from *https://www.reply.com/SiteAssets/Images/IDG-Studie-Process-Mining-RPA-2019.pdf*

Lünendonk & Hossenfelder (2019).
Robotic Process Automation – Sonderanalyse zur Lünendonk- Studie „Der Markt für IT-Beratung und IT-Service in Deutschland". Retrieved on 20.02.2020, from https://www.luenendonk.de/produkt/studien-publikationen/luenendonk-sonderanalyse-2019-robotic-process-automation/

PricewaterhouseCoopers (2017a).
What PwC's 2017 survey tells us about RPA in financial services today. Retrieved on 20.02.2020, from *https://www.pwc.com/us/en/financial-services/publications/assets/pwc-fsi-whitepaper-2017-rpa-survey.pdf*

PricewaterhouseCoopers (2017b).
Successful implementation of RPA takes time – Lessons learnt by 18 of the largest Danish enterprises. Retrieved on 20.02.2020, from *https://www.pwc.dk/da/services/2018/RPA-rapport-engelsk.pdf*

Warth & Klein Grant Thornton (2019).
RPA, Predictive Analytics und Künstliche Intelligenz – Wo liegen die Anwendungsbereiche im Controlling? Gemeinsame Studie von Warth & Klein Grant Thornton und der Hochschule Ruhr West. Retrieved on 20.02.2020, from *https://www.wkgt.com/globalassets/1.-member-firms/de-germany/pdf-download/grc/studie_robotic_process_automation_190514_nst.pdf*

3.2 UNDERSTANDING OF RPA

RPA is a term that has only recently begun to spread widely and receive broad attention. Unfortunately, there are many different definitions in the literature that emphasize different aspects. Nevertheless, there is a certain core, which many definitions include. RPA is referred to as a technology which is mimicking human behavior on computer systems.

It can act like virtual employees that perform tasks which have three main characteristics: The associated processes are manual, repetitive and rule-based. The use of RPA aims at the automation of such processes. Automation robots use structured data as input and they interact with different systems and software. A definition many publications are referring to is the definition developed by the Institute for RPA & Artificial Intelligence which describes RPA as

For the scope of this study, the concept shall therefore describe the automation of processes in a robotic way, not through physical robots. The automation happens through digital robots that, like their real-life counterparts, aim at mimicking human or natural behavior.

It is worth noting that our approach to defining RPA in the context of this study deliberately excludes other categories of automation. For example, more potent approaches to automation lie in hard-coding, i.e. programming, routines of automation with the use of common programming languages. We choose to exclude such approaches from our definition, as we would like to focus on solutions that are easy to implement meaningful solutions "on the edges" of organizations, in departments and teams that do not have direct, easy access to IT departments and bottleneck programmer resources.

» The **application of technology** that allows employees in a company **to configure computer software or a ‚robot' to capture and interpret** existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems. « (IRPAAI, 2019).

Hence, we do not primarily consider solutions that can be obtained with the help of tools that are common and wide-spread in business use, specifically in Controlling contexts. Microsoft Excel and Visual Basic (VBA) macro programming is therefore equally dismissed from our research scope as well as the programming of solution with the help of proprietary programming languages of ERP software as for example SAP's ABAP.

In shorter terms: we exclusively consider RPA software solutions that make process automation easy for non-IT staff with limited, but existing knowledge of IT aspects. The software should be useable for a "typical Controller profile" with a learning background in business administration rather than information technology.

In order to discriminate further between specific types of automated behavior, we divide RPA approaches into two types: click agents and dialogue agents. Click-agents are using the same interfaces that any human user would use. They are therefore typically operating on Microsoft Windows, opening, closing, maximizing applications in their respective windows. They log on to applications, search for or filter information, they cut, copy, paste, input, type and switch between contexts of business applications and internet browsers. They also take decisions based upon rules that their companies devised before, just as humans would. Dialogue agents are agents that the user can engage with in the same ways in which they would engage with co-workers. A currently very typical approach is to set up chatbots. These bots are most commonly either text-based or natural language-based. Text-based chatbots can be found on client facing websites very commonly already these days. Natural, spoken language-based agents are found in the services of Amazon's Alexa, or Google's Google Home. Such agents possess knowledge of a specific scope, typically about products, services or processes that help the engaging party find the information regarding these products, services or processes that they look for. Dialogue agents are therefore also an alternative way of querying databases. In extension, robotic processes can be connected to other applications and in this course also trigger processes, save or update information that is stored in IT systems.

» In order to discriminate further between specific types of automated behavior, we divide RPA approaches into two types: click agents and dialogue agents. «

3.3 ARCHITECTURE OF RPA SOFTWARE TOOLS

Although the structure of RPA software differs from provider to provider in detail, a comparable basic architecture consisting of four components can be identified: a developer component, a process recorder, the actual software robot, and a monitoring and control component. Depending on the specific RPA provider, the naming of those components is different.

The **developer component** is typically a graphically assisted workplace where workflows can be designed, whose elements represent not only actions the bot must take, but also elements of the graphical user interface of the operating system that would commonly be operated by a human user. Any user that is accustomed to designing processes in, e.g. Microsoft Visio, would be quick to understand and adapt the general structure.

However, the automation workflow requires a lot more detailed information and instructions than a mere flowchart would typically include. Each step is describing a human action as it would be executed on the computer, be it a keystroke or a mouse click. The second type of component helps in this regard. It is not a standard, but an often seen module of, especially advanced, RPA solutions: the **process recorder.** The process recorder allows humans to "show" to a program how they operate their computer while executing a process. After the click of a "record button" they start opening the applications they need, logging in to them, searching for files, reading or writing attributes, saving data, etc. These recordings may be used not only to document processes in a level of detail that few companies are able to present. In addition, in some RPA applications they serve as blueprints for editing the automation process in the developer component. This way, the modeler must only focus on variables and executions and the process of modelling is starting from a much higher level of detail already defined.

The result of the modeling in the developer component is a **software robot.** The robot can either be installed on a single desktop (desktop client) or on be held on a central server (application server). Whether the robot is running on a central server or a single desktop, it usually accesses the application level and not the data management or data storage level, although this is technically possible.

The **monitoring and control component** is found in RPA solutions that are aimed at enterprise-scale deployment. Such modules manage multiple bots and commission work packages to them. One may think of them as a sort of team leader for digital worker robots. It is often also the hub for operational reporting and the first place to go to when a human automation administrator wants to gain an overview over the state of affairs.

» A comparable basic architecture consisting of four components can be identified: a developer component, a process recorder, the actual software robot, and a monitoring and control component.«

3.4 MARKET OVERVIEW ON RPA SOFTWARE TOOLS

Looking at the market of RPA solutions that fall into the definition given above, we find known market observers have already in detail monitored the market of solution providers. Both Gartner and Forrester research offer annual studies that not only describe the solutions and their corresponding product vision and strategies, but also order them on different continuums (Forrester Research, 2019; Gartner, 2019). For Forrester, for example, strength of strategy, strength of offering as well as current market presence is of interest. Gartner in turn rates RPA solutions with regard to completeness of vision and ability to execute before situating them in their "Magic Quadrant" portfolio.

Both organizations rate the same three solutions among their top results: UiPath, Automation Anywhere and Blue Prism. A composite list of RPA solutions, which includes both Gartner and Forrester results as well as additions made by the authors, is presented in Table 2.

Table 2: List of available RPA software solutions

#	Vendor/Software	Forrester	Gartner
1	UiPath	Leader	Leader
2	Automation Anywhere	Leader	Leader
3	BluePrism	Leader	Leader
4	EdgeVerve	Leader	Challenger
5	NICE	Strong performer	Challenger
6	Softomotive	Strong performer	Niche Player
7	WorkFusion	Strong performer	Visionary
8	Intellibot	Strong performer	Niche Player
9	Kofax	Strong performer	Niche Player
10	Pegasystems	Strong performer	Visionary
11	Servicetrace	Strong performer	Niche Player
12	Kryon	Strong performer	Niche Player
13	Another Monday	Contender	Visionary
14	AntWorks	Contender	Niche Player
15	SAP	Contender	Niche Player
16	AutomationEdge	./.	Niche Player
17	HelpSystems	./.	Niche Player
18	Jacada	./.	Niche Player
19	NTT	./.	Niche Player
20	Datamatics	./.	Niche Player

Regarding costs, our research has indicated that most of the top-tier solutions are close to one another regarding the terms and conditions. In addition, in the course of fulfilling strategies of a deeper, faster and more thorough market penetration, almost all major vendors offer free application licenses for educational or testing purposes. Especially educational licenses are relevant for institutes of higher education to build effective automation skills in future workforce. Some vendors are contemplating open-source strategies for their software, focusing on support and consulting services as well as newly defined online-subscription models for payment. Also, “community options” are offered, which basically allow free individual use for experimentation and evaluation.

UiPath

This software comprises three IT software modules: „Studio“ models processes with a look and feel like Microsoft‘s Visio, „Robot“ is the executing instance that uses the computer operating system as a human would and „Orchestrator“ is a central management module with which an administrator can plan and monitor the execution of different bots. The user can choose between process templates and blank processes. The user can choose whether they would like to record activities in a Windows application, or a webpage. As seen with several other RPA solutions, the program will highlight whatever element the user is pointing at with their mouse in order to avoid confusion about what element the user wants to interact with while recording the process.

For using UiPath a certain degree of technical affinity is advisable. Even easier applications quickly lead to a point where the process designers have to be able to understand technical details of the operating system, at least on a high level.

UiPath is at least in Germany, one of the longest standing players. It has gained much popularity over the past decades, eventually replacing Blue Prism as the default option for many companies. This is important, because many adoption paths, similar to other software types, usually include the market leaders as entry-points into a new technology.

Blue Prism

Blue prism has six different modules: “Home”, “Studio”, “Control Room”, “Dashboard”, “Releases” and “System”. The “Studio” module is used for bot design, while the “Control Room” module offers additional aspects to model the environment in which automation is planned to take place. “Releases” and “System” serve the purpose to administrate the deployment and user access to bots created by Blue Prism. In consequence Blue Prism’s primary bot creating activities are taking place in the „Object Studio“ and „Process Studio“. The latter reminds the user more of a flow chart designing software, like e.g. Microsoft Visio. On the left hand side are flowchart elements that can be dragged and dropped onto the flow chart development pane on the right hand side. The checkered background of the “Process Studio” view adds to the impression that the software engineers behind this RPA solution have a decent technical background and perspective onto the way robotic process automation should be designed. Even more than UiPath, a user should be willing to work in a programming-like manner; even moderately complex solutions would pose a challenge for users that lack technical expertise. All the while, Blue Prism seems very flexible and yet structured at the same time, it resembles a visual programming language rather than an tool that lets a user explain their boring, repetitive actions to a software bot so that it would alleviate them from these tasks immediately.

BluePrism also has an „Application Modeller“ wizard that enables the user to analyze software applications. It contains a „spy mode“ that helps the RPA software identify elements like buttons or text fields in programs. BluePrism supports this process of describing how users interact with the software that they aim to automate in a more profound, but also complicated way. For example, in order to simulate a user‘s clicking on four buttons within a calculator application, four different flow charts have to be created, drawn, correctly set-up and connected with each other, before a corresponding action (add two single-digit numbers in a calculator software) can be executed by the bot.

Automation Anywhere

Automation Anywhere is divided in three different modules: „Bot Creator“, „Control Room“ and „Bot Runner“. The “Bot Creator” is where bots are designed, before being uploaded to the „Control Room“. The latter provides for centralized user management, automated deployment, dashboarding and source control. This architecture is more comparable to UiPath than to BluePrism.

Automation Anywhere has an easy to include module for reading data from PDF files that are not already machine-readable. It can do so, by letting the user specify areas vaguely where they expect specific data to be display on a PDF page. For example, a user may have invoices from one creditor and would like to extract invoice date, number, amount, and so on from similar pdf files. Then the user can specify quite simply, where this information can be found on the PDF file, so that it gets extracted and noted in an excel file for further use. This functionality is not exclusive to Automation Anywhere, but it also displays another interesting architectural difference: the cloud integration. The analysis of PDF documents takes place in the cloud and can therefore benefit from latest computer vision and document analysis algorithms as Automation Anywhere develops and includes them in their solution.

Obviously, these brief descriptions cannot be comprehensive and only highlight individual properties of these solutions. For additional information, a plethora of information on vendors’ websites as well as review material is available online.

» Regarding costs, our research has indicated that most of the top-tier solutions are close to one another regarding the terms and conditions. «

4 RESULTS OF THE EMPIRICAL PART OF THE STUDY

4.1 EXPERTS' UNDERSTANDING OF ROBOTIC PROCESS AUTOMATION RPA

The definitions of RPA given by the various experts are to large extents overlapping. All define RPA as a piece of software that automates tasks that usually would be performed by humans. Most experts agree that RPA solutions execute the automation process by mimicking the actions of the human user on applications that also the user would control, using a keyboard and a computer mouse. Some also suggest that RPA requires structural data to be present for the digital robot to work on. Yet, artificial intelligence (AI) is not necessarily a defining property of RPA, a shared conviction by the interviewees. Rather, future development of RPA products may include such features in increasing extents. A minority of respondents compares RPA to "low code" equivalents of computer programming.

4.2 RELEVANCE OF RPA WAS A SOLUTION

All experts are convinced of a currently high relevance of the topic RPA. In addition, all agree on further points that underline this relevance for companies. First, RPA is relevant for companies that execute high numbers of very similar processes as a standard service. A high number of process repetitions are necessary for RPA solutions to become effective in terms of efficiency gains. This is the case for larger companies rather than for smaller ones. High numbers of repetition set the costs for initial automation implementation in perspective. Second, RPA solutions are relevant where companies have not yet fully harmonized or integrated their IT/business application landscapes. Software-based automation can play out its cards when processes need to bridge several systems or media gaps. Third, RPA solutions are potentially relevant for all areas of a firm, and across all industries. Fourth, automation solutions come with a simple and easy-to-understand narrative of high returns on invests. This way, they catch the attention of many deciders. This is especially the case, when managers are systematically looking for cost saving potentials.

4.3 BENEFITS OF AN RPA APPLICATION

The following main benefits of RPA in form of outcomes are mentioned by the interviewees:

- **Reduced costs**: The main argument for the use of RPA is the reduction of process costs. As reference basis usually the process costs before automation are used, the savings potential is then calculated in % values. Another way is to calculate a potential in the form of savings in full-time equivalents (FTE) of staff capacity. This does not mean that the employees previously involved in the process execution are later released and no more costs are incurred for them. Rather RPA aims to free those employees from repetitive, time-consuming processes so that more capacity is available for value-adding activities.

- **Increased speed**: Robots are very fast and sometimes the speed of execution has to be reduced to match the speed and latency of the application on which these robots work. Increased speed can result in shorter response times and an increase in the volume of the tasks being performed.

- **Increased productivity**: One robot corresponds to up to three full-time equivalents (FTE). This is based on the simple calculation that an FTE works on average eight hours a day, while a robot can work up to 24 hours without a break.

- **Higher quality services, greater accuracy**: With reduced human error and greater compliance, the quality of work is much better. Also, while it is difficult to trace the point at which the human error occurred, the detection of errors is much simpler in RPA. This is because every step in the automation process is recorded, making it faster to pinpoint errors with ease. A reduction or removal of errors also means greater accuracy of data, leading to better quality analytics and hence better decision making.

- **Reduction of compliance risks**: Robots, different from employees, do never deviate from the defined set of steps to be taken while doing a task and hence it will certainly result in better compliance.

- **Time savings**: Not only does the virtual workforce complete large volumes of work in a shorter span of time with precision, but they help save time in another way too. If there is any change - say, a technology upgrade it is much easier and faster for the virtual workforce to adapt to the changes. This can be done by bringing about modifications in the programming or introducing new processes. For humans, it is difficult for them to learn and get trained in something new - breaking from the old habit of performing repetitive tasks.

- **Better customer service**: Since robots can work around the clock, capacity increases. This leaves humans to focus on customer service and satisfaction. Also, better quality of services delivered to customers at faster speeds greatly boosts customer satisfaction.

- **Increased employee satisfaction**: With repetitive, dreary tasks now being taken over by the virtual workforce, employees are not just relieved of their workload, but can also engage in better quality work that requires the use of human capabilities and strengths such as emotional intelligence, reasoning, or tending to customers. Thus, RPA doesn‘t take away work. It frees employees from tedious, mind-numbing work, giving them an opportunity to engage in much more satisfying activities.

All experts agree that these benefits are not only realizable in general, but also within the area of application of Controlling.

4.4 CHALLENGES AND OBSTACLES OF AN RPA APPLICATION

The interviewees also mentioned that although often beneficial, the use of RPA can also pose challenges or even cause disadvantages.

Bots must be installed, regularly updated, maintained and continuously controlled. Errors and sudden system crashes must be adequately managed. Therefore resources must be planned and kept available, often in the form of employees from the IT department or relevant functional areas. If neglected, this can result in significant productivity losses.

Another aspect is that in contrast to the use of application programming interfaces (API), RPA is usually the more unstable or „volatile“ solution. Interfaces are used for thorough system integration. If there is an option to choose from these two alternatives with comparable general conditions (e.g. regarding effort and duration of implementation) and there are no other relevant decision factors, in most cases the automation via interface should probably be preferred in comparison to the automation with RPA.

Sometimes it is also said that RPA would tempt decision-makers to avoid an extensive modernization of their legacy systems and to use the supposing faster route via RPA. It should therefore not be used as a substitute for necessary renewals of the underlying applications and systems. RPA is rather a tool which – cleverly implemented and deployed at the right places – offers agility and rapid change and complements a modern IT landscape.

Regarding existing obstacles of an RPA application in companies in general or in the Controlling function specifically, the following aspects are mentioned by the experts:

- Internal resistance (e.g. from the works council or specific functions),
- lack of support from the top and middle management level,
- key resources are actually heavily used for other purposes already and therefore have hardly any capacity for RPA projects,
- missing budgets even for smaller pilot projects,
- security concerns.

» RPA is rather a tool which – cleverly implemented and deployed at the right places – offers agility and rapid change and complements a modern IT landscape.«

4.5 COMPETENCIES REQUIRED FOR SUCCESSFUL RPA APPLICATION

For the implementation and operation of RPA solutions, different skills and activities are required, which are categorized into RPA roles. Each role is either filled out by specialized employees or several roles may also be filled out by one employee. Within the expert interviews three main RPA roles are described.

The **RPA business analyst** is characterized by the fact that he/she has distinctive knowledge in the individual business processes as well as in RPA technologies in general. He/she is responsible for the selection of appropriate processes, which should be supported by RPAs. For the recording/documentation, analysis and optimization of the identified business processes, he/she needs knowledge in Business Process Management (BPM) and Business Process Reengineering (BPR). In this context, the RPA business analyst also requires distinct analytical and communication skills to facilitate the exchange with other process participants. Although the business analyst does not have in-depth technical knowledge of RPA solutions, a basic understanding of the functionality and the limits of RPA solutions is indispensable. Sometimes business analysts also develop simple robots directly themselves and thus act as citizen developer. The RPA business analyst also acts as a contact person for other RPA roles, when it comes to questions about business processes. RPA business analysts are mostly located in the business area.

The **RPA developer** is responsible for technical design, development, testing and documentation of the robots. The developer ensures that the robots are smoothly connected with software applications and - if in use - technical links between them other digitalization technologies, such as for example image recognition software and OCR-engines. Together with the RPA business analyst, he/she ensures that the requirements of the business area are (technically) completely mapped. When testing he works closely with the division. Together they define the test concept, test cases and test procedure. After implementation the RPA-Developer also takes care of the technical maintenance and further development of the robots. In order for RPA developers to be able to fulfil their role, they need to have a profound technical knowledge of the RPA solution used. RPA developers often have knowledge of several RPA platforms. Extensive experience in scripting and/or programming languages (e.g. in C#, .Net, VisualBasic) are also required. A basic understanding of the business processes together with analytical and communicative skills complete the profile of the RPA developer.

The **RPA solution architect** manages the selection process and the technical introduction of an RPA solution. In doing so he/she also defines the technical specifications of the architecture and later provides holistic support for the RPA solution. For offers, questions or negotiations with RPA providers, the RPA solution architect is the contact person of choice. Within the company, the solution architect works closely with the IT department. Together they define the installation environment, select the necessary hardware and define/implement technical Service Level Agreements (SLAs) as well as security and access guidelines. The RPA solution architect typically has a strong IT background. He/she contributes extensive technical experience in the design, description and operation of IT solution architectures. Agile development methods (e.g. SCRUM) are assigned to RPA solution architects. Furthermore they have strong communicative and coordinating capabilities to support the different RPA stakeholders (e.g. business units, RPA developers, IT department, RPA vendors).

According to the interviewees, companies generally have a sufficient number of qualified RPA business analysts, but there is currently rather a lack of skilled RPA developers and solution architects.

4.6 MARKET AND SOLUTION KNOWLEDGE

In the interviews with the experts it has become clear that the companies‘ knowledge of the market for RPA solutions as well as the individual characteristics of those solutions varies considerably. Customers often approach the consulting companies for an intended project with already having a specific RPA solution in mind (e.g. the tools of the market leaders), but a detailed analysis as basis for the selection decision often was not been carried out by the companies. Consulting companies mostly work tool-agnostic, which means that they do not use only one specific RPA tool in their implementation projects. They rather offer a broad range of RPA tools available in the market as well as a previous selection of a customer- and project-specific RPA tool based on a predefined checklist of selection criteria as well as the specific project objectives. It often happens that the solution originally favoured by the customer is not the best solution for the intended project or the company in general.

4.7 TYPICAL USE CASES

In general, use cases given by the experts were relatively similar. Differences resulted from personal experiences with high-complex use cases, i.e. some were able to describe complicated use cases very sophisticated while others remained with their use cases largely on a low-complexity level.

Simple use cases comprise the collection of data from various sources, the grooming of base data as well as the compilation of lists and low-complexity reports. A typical example, relevant for the Controlling function, is the compilation of data from various systems and the subsequent compilation of a monthly report.

Respondents also named these other typical use cases:

- HR onboarding,
- attribution of credit card positions to travels in travel reimbursement processes,
- booking of incoming invoices,
- review of open orders,
- mail-to-ticket-processes in service centers,
- master data updating/integration, and
- duplication checks.

For Controlling especially the report preparation offers high potential for use cases, all the preparatory work that a Controller normally has to do, such as data collection, merging data from different subcompanies, group consolidation of the data and to some extent standardized commenting, all this preparatory work can certainly be done well with RPA.

Some experts noted that companies, once they had introduced automation, tended to increase the extent of automation. They would do so by adding more steps down-stream of the process or by implementing process branches that are rather “exceptional” than “standard”.

Complicated cases consist of the same identified building blocks, but display increasing lengths and may include communication with humans. For example, such cases implement the use of email or software notifications, resulting in robots that have to wait for human input. What reportedly makes use cases complicated is not the number of sources or output formats, but rather the number of rules and exceptions to rules to obey. Another driver of complications is the integration of human feedback into the automation process.

Taken together, the experts’ use case examples left out no area of a typical company. All support functions could therefore benefit from automation, given that they have repetitive processes based on high quality data and rather few process variations. This is also the case for the Controlling function.

The experts agreed largely that companies can take first, simple steps towards RPA implementation by programming robots for simple data collection and/or reporting use cases, or similar pilot use cases. Such endeavors would typically take 2-4 weeks, resulting in 10-40 man days of conceptualization and implementation.

4.8 POTENTIAL OF RPA IN CONTROLLING MAIN PROCESSES

We used the Controlling Process Model 2.0, published in 2018 by the International Group of Controlling (IGC), to discuss the possible areas of implementation for RPA within the Controlling function. This model has a hierarchical structure: Controlling as a process on level one within the process landscape of a company comprises ten main Controlling processes, representing process level two (see Figure 1). The processes in dark blue color, ranging from planning, budgeting and forecasting to business partnering, form the core of Controlling. These core processes are supplemented by other relevant processes in light blue, which are carried out in cooperation with other corporate functions (strategic planning, project controlling, risk controlling and data management).

The experts especially see a high degree of usability of RPA in the Controlling main processes management reporting, planning, budgeting and forecasting, cost accounting and data management. In management reporting the report preparation offers high potential for automation, the same applies for data enrichment and data quality assurance in data management and the summary and consolidation of individual plans in planning, budgeting and forecasting. All other main controlling processes probably offer little or no potential for the application of RPA.

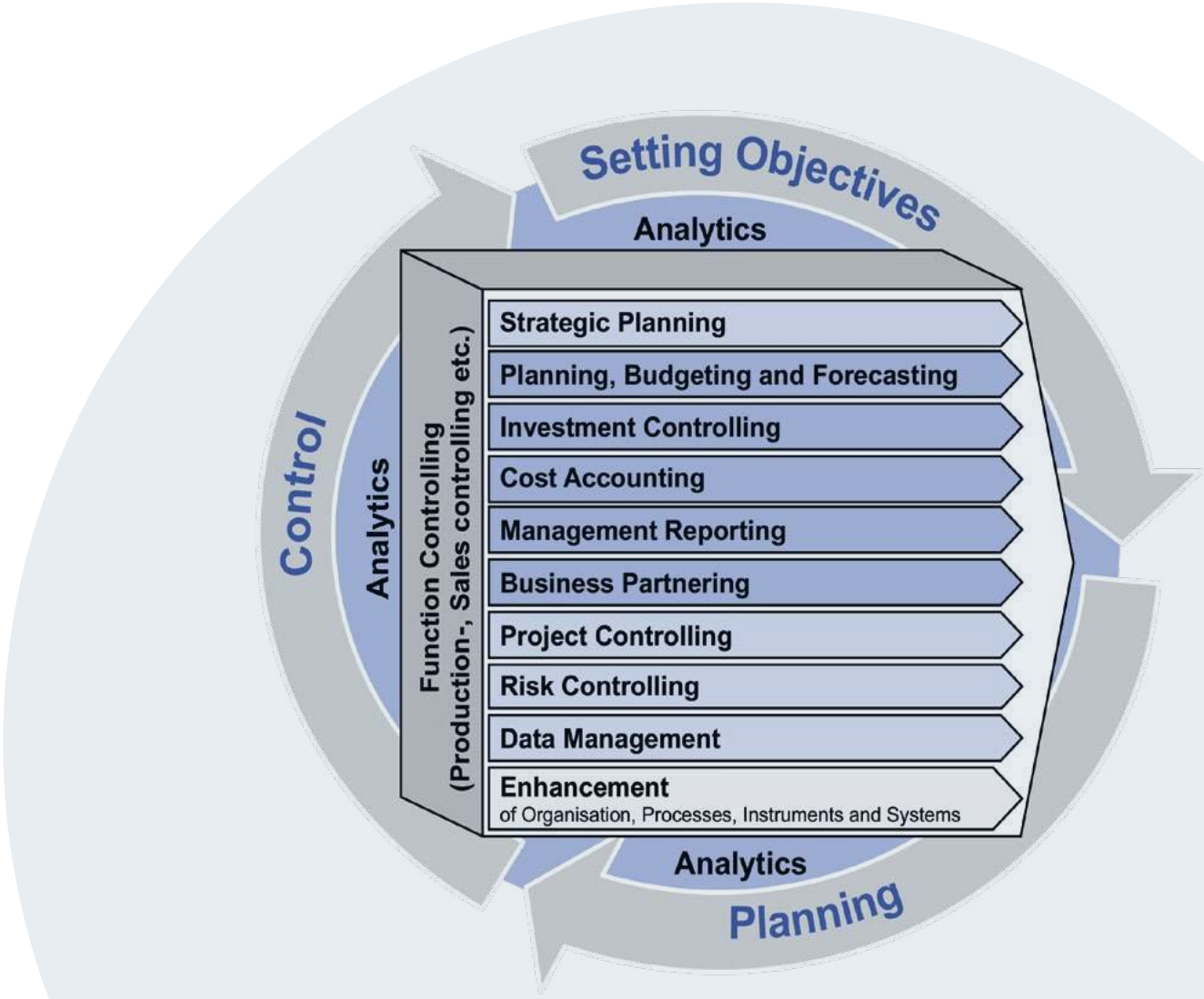


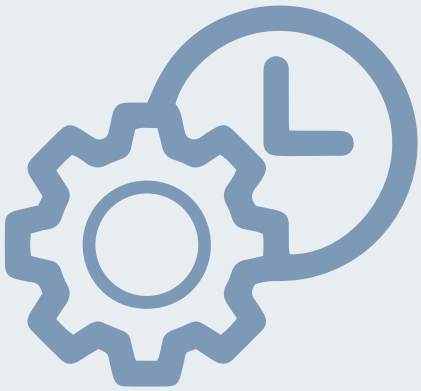
Figure 1: IGC Controlling Process Model 2.0 (Source: IGC, 2018)

4.9 OUTLOOK

With RPA, a new digitalization technology for automation is currently establishing itself on the market. The experts agreed that unlike previous automation solutions, RPA can be implemented relatively quickly and cost-effectively, partly without profound programming knowledge. Against this background, the increasing use of RPA in companies in the context of Controlling isn't surprising. RPA seems to be a credible solution for many companies and an answer to the increasing pressure for efficiency that financial organizations are exposed to.

Additionally, the experts largely expect that fields of application of RPA will systematically expand in the coming years, from today's highly repetitive, simple tasks to more sophisticated, complex ones (intelligent, smart or cognitive automation). A decisive role is played here by linking RPA with other digitalization technologies like machine learning, chatbots or artificial intelligence. With this, the ‚simple' robots of today, where every step of the execution, no matter how small, must exactly be specified, will get much more intelligent and independent. The exciting question in this context is how the cooperation of the robots with their human colleagues will then look like.

» RPA seems to be a credible solution for many companies and an answer to the increasing pressure for efficiency that financial organizations are exposed to.«



5 CONCLUSION

In our study, we set out to explore the kinds of efficiency gains that can be expected from the introduction of RPA solutions, especially within the Controlling profession. We have analyzed the literature, the market as well as individual vendors along with their solutions. With the help of experts, we have identified process areas, within the Controlling Process Model and beyond it, that have low or high potentials for RPA. In addition, we have given an overview over typical introductory and more advanced use cases.

Experts agree that RPA can enable considerable efficiency gains in the field of Controlling, especially in highly repetitive processes with small levels of variations and few deviations from the standard. In practice, most typical RPA use cases would therefore support management reporting, data management processes, cost accounting or planning, budgeting and forecasting. Data collection activities from several systems or other sources like network drives are among the first to tackle, when organizations begin to make use of RPA. Those processes can benefit from higher processing speeds, constant availability up to 24/7 and constant quality of robotic automation assistance.

This effectively frees Controllers' capacities for more qualitative challenging tasks. Only in deployment scenarios that are more sophisticated, are multiple FTE of human resources likely to be replaced effectively. However, one effect that has a potentially much higher leverage is that RPA introduction will directly (automatic data grooming) or indirectly (through the need of improving data quality in order to make RPA technology work effectively) improve base data as well as transaction data quality, which subsequently leads to higher process quality. These returns last much longer and have uncountable, yet minimal positive impacts in the future. For organizations that put digitalization in their center of attention, this is an important point.

Therefore, hearing experts mention similar typical implementation examples does not come as a surprise. Duplication checks as well as automated, and therefore standardized, base data management use cases are rather easy to implement and serve as good examples to test RPA technologies. For companies starting to explore RPA as a novel solution, the three most established vendors are very often vendors of choice. However, companies do also turn to consultants to gain this market overview, because they lack the required competences to formulate their requirements and evaluate the solutions during the selection process.

However, this can become a problem later. Companies tend to overestimate the potential returns and underestimate the efforts they will incur when implementing automation solutions at scale. Maintenance, exception handling, governance, alignment and coordination with compliance teams and the IT department are often forgotten. Also, operational risks caused by automation should be reviewed carefully before starting ever more automation projects.

Organizations that go beyond a piloting stage can consider centralizing necessary resources and capabilities into shared service units. This way, aspects like risk management as well as proper operations control can be accounted for structurally. Also, optimal resource utilization of automation-know and leverage on beneficial side-effects like greater degrees of process documentation and quality, higher data quality and increased compliance can be managed from a central unit.

Units beginning to experiment with RPA technology without a central unit should at least keep adjacent, affected units informed. IT departments can offer help, give advice on how to build up necessary competencies and what RPA operations could look like in the long run. The employment of RPA may seem like a clever choice for those units that “cannot wait” for typically well- or even over-utilized IT departments, to implement system improvements and work out thorough system integration. But the decision comes with long-term risks that should be carefully weighed in against short-term improvements. RPA needs to be implemented with an integrated perspective on all side effects and potential risks.

Such an encompassing view requires competencies that are IT competences in general. No matter how easy simple use cases may seem to be implementable with RPA solutions, complexity often lies within the details or within the scale. Next to process analytical skills, computer science skills will quickly be required when implementation gets more complicated and architectural competencies are necessary as solutions grow.

For beginners in the RPA field, however, the market of solutions is a playground for anybody wanting to try out how easy or complicated IT-based process automation may be. Free individual licenses allow easy access to the latest solutions. This enables interested users to evaluate whether they meet or lack the requirements with regard to competencies in the mentioned fields. A plethora of online material, like YouTube-tutorials, helps take first steps and become inspired by the flexibility of the tools and the potentials that it therefore bears. Organizations of higher education are also starting to integrated software automation in the curricula. The number of offerings on online courses on Udacity, Coursera, Edureka or similar services can be expected to increase in the future.

As a result, RPA offers high flexibility for leveraging on efficiency potentials. It should not be over-glorified as a silver bullet but rather be evaluated carefully with regard to risks and long-term effects like data security, necessary retained organization, necessary process stability, needed skills and competencies. If seen as a tool rather than an encompassing approach to digital process management, it can be of great value to Controlling units.

» If seen as a tool rather than an encompassing approach to digital process management, it can be of great value to Controlling units.«

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ANNEX

ANNEX 1: INTERVIEW GUIDE

1. BACKGROUND OF THE INTERVIEWEE(S)

- Would you please briefly introduce yourself and your company by name?
- What is your position or role in the company?

2. HORIZON OF EXPERIENCE ON ROBOTIC PROCESS AUTOMATION (RPA)

- How do you rate your personal knowledge in the field of RPA: Are you a beginner, an advanced or an expert?
- Which knowledge do you have in detail?
- What is your own role in the context of RPA in your company: pure sales activity, technical implementer and/or process facilitator?
- Have you implemented own use cases for RPA (at your company or at the customer‘s site respectively)?
- How do you rate the experience in the field of RPA for your company?
- Do you already use RPA in your own company?
- Do you offer RPA as part of your company‘s service portfolio for customers?
- If so, what services are offered?

3. UNDERSTANDING AND CURRENT RELEVANCE

- What is your understanding of RPA?
- What are the main characteristics of RPA?
- How would you define RPA in terms of content?
- What is your current assessment of the importance of RPA in a business context?
- What is the potential of RPAs for companies in general? What is its potential for Controlling in particular?
- What are the expectations of users and customers regarding the use of RPA?
- In your experience, is the expectation too optimistic (positive effects are overestimated), appropriate (positive effects are realistically assessed) or too pessimistic (positive effects are underestimated)?

4. EVALUATION

- What skills are needed to implement RPA use cases? In your experience, are those skills available in companies/Controlling departments?
- Which solutions/tools for RPA are you aware of/do you use in your projects?
- Are your customers usually able to choose the right RPA solution for them on their own? If not, why not?

5. IMPLEMENTATION

- What are the easiest/most difficult cases of automation you have already seen implemented?
- Are there typical use cases (also outside the Controlling function)?
- How complex is it to implement RPA use cases (with regard to time and costs)?
- What are the success factors and what are the most common obstacles of implementation?
- What are typical mistakes which happen in the initiation phase or during the implementation?
- Are there any risks that are underestimated by customers?
- What are the main effects of the RPA use cases?
- Can these effects be quantified in terms of cost-benefit ratios?

6. CONTROLLING PROCESSES

- Are you familiar with the Controlling process model of the International Group of Controlling (IGC)? [If not, short introduction based on visualization]
- In your opinion, which of the main controlling processes are suitable for the use of RPA (preferably with prioritization)?

7. OUTLOOK

- How do you see the significance of RPA in the next three to five years in the corporate context and in Controlling function in particular?
- What development do you forecast?
- What do you think are important drivers or barriers for an increased use of RPA in the near future?

ANNEX 2: LINK LIST WITH USEFUL WEB CONTENT ON RPA

#	Title	Link	Type of Material
1	Robotic Process Automation (Horváth & Partners)	https://www.youtube.com/watch?v=S2EiJNPENbM	Short Video (in German)
2	Robotic Process Automation (RPA): how does it work? (KPMG)	https://www.youtube.com/watch?v=xW95yb6J1eU	Short Video (in English)
3	How Does RPA Work? | What Is RPA? | RPA In 10 Minutes (Edureka)	https://www.youtube.com/watch?v=5fn8QcIGJc0	Short Video (in English)
4	Prozessautomatisierung durch Roboter (BearingPoint)	https://www.youtube.com/watch?v=xAtHMs8lsts	Short Video (in German)
5	What Is Robotic Process Automation (RPA)? | Introduction To RPA (Simplilearn)	https://www.youtube.com/watch?v=H5VKUajGDdI	Short Video (in English)
6	Robotic Process Automation Full Course - 10 Hours	https://www.youtube.com/watch?v=MBI-3Yb30FA	Tutorial (in English)
7	Robotic Process Automation with Microsoft Power Automate, UI flows and AI Builder	https://youtu.be/NxJ2Zch7M2o	Tutorial (in English)
8	Blue Prism Training	https://www.youtube.com/watch?v=GF6_b2FfVsw&list=PL4SEtvjUqihFh-iFvb_s0VAhPCX1tzg2A&index=2	Tutorial (in English)
9	RPA Tutorial for Beginners, UiPath	https://www.youtube.com/watch?v=NubOFuwYGIE	Tutorial (in English)
10	RPA Tutorial for Beginners, Introduction to Blue Prism	https://www.youtube.com/watch?v=jzuq94cH8Fk	Tutorial (in English)
11	RPA Tutorial For Beginners, UiPath	https://www.youtube.com/watch?v=CeQ0ESO6Ulw	Tutorial (in English)
12	RPA Tutorial for Beginners, UiPath	https://www.youtube.com/watch?v=ngEc-QimK8Y	Tutorial (in English)
13	Robotic Process Automation (Ernst & Young)	https://assets.ey.com/content/dam/ey-sites/ey-com/en_us/home-index/ey-robotics-process-automation.pdf	Lecture Material (in English)

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INTERNATIONAL GROUP OF CONTROLLING

The International Group of Controlling (IGC) is an interest group that was founded in 1995 as an international cooperation of institutions and companies active in the field of education, training, and research in Controlling. Since then, IGC has set itself the goal of establishing international standards for Controlling in corporate practice as well as the training and further education of Controllers. It offers its members a forum for a continuous professional exchange of opinions and ideas.

IGC is involved in the development, coordination, and dissemination of internationally uniformly applicable Controlling concepts and terminologies, the occupational image and role models of Controllers as partners in management, and standards for the qualification of Controllers and managers.

Further information is available at:
https://www.igc-controlling.org/