The Impact of Robotic Process Automation on accounting information systems French Multiple case studies

O impacto da automação robótica de processos nos sistemas de informação contábil Francês Estudos de caso múltiplos

JOSHUA ONOME IMONIANA

HUGO CURRAS

MARCIO KAWAHARA IGUMA

ABSTRACT

This study examines the impact of robotic process automation on the accounting information systems of French organizations. Robotic Process Automation (RPA) is being introduced more and more in companies to address the risks of manual and repetitive tasks. The methodology adopted is interpretative, based on a constructivist perspective. The data corpus consists of narrative of six experts representing each case study of the implementation of RPA drawn upon in this study. The results show that RPA has an impact on companies' IT cost, security, accuracy of data processing and agility of results derived from accounting information systems. Generally the impact reflects on the characteristics of embedded technology by accompanying the rules of operations to ensure internal controls. Based on the practical implications, we conclude for the positive and negative impact on the aspects of the embedded technology of RPA implementation. Overall, for the originality of the study, the findings contribute to academia by filling the gap in the literature and drawing attention to the implication of the implementation of RPA for practitioners, policymakers, employees, business accounting processes, and the society at large.

Key Words: Robotic Process Automation, RPA, Accounting Information Systems, Accounting, Auditing.

1. Introduction

The Robotic Process Automation (RPA) is a technology developed to automate tasks, usually repetitive ones. Since coming into existence during the year 2000, this technology has been implemented more and more in all spheres of life, including the realms of accounting information systems, where it is used to automate frequently run accounting tasks. RPA functions would link different software and applications together by using the same process a human would take while performing the same task. It will take the same path and the same steps, just faster. However, these tasks need to be simple, with a clear process, and repetitive (Syed et al., 2020). In finance, RPA did not enter through corporate finance but through market finance. It started with high-frequency trading and has been doing so for the last ten years, especially in risky operations. After that, it started being used more in corporate finance (in treasury, for instance) for processing accounts receivable and payable, but in the beginning, mostly in the front-office tasks, since organizations wanted to keep track of middle and back-office tasks.

Prior research on robotic process automation has been done by a couple of authors, such as Cooper et al. (2019) on "Robotic Process Automation in Public Accounting, Lacurezeanu, Tiron-Tudor, and Bresfelean (2020) on "Robotic Process Automation in Audit and Accounting," or Vasharhelyi and Rozario (2018) on "How Robotic Process Automation is Transforming Accounting and Auditing." These authors discuss the impact of RPA directly on accounting, auditing, and the profession; however, certain nuances relating to the impact on accounting information systems and digital tools such as ERP are yet to be investigated, therefore leaving some research avenues to be explored.

In this regard, the aim of this study is to examine whether the implementation of RPA in the accounting information systems of companies generally ensures the characteristics of the embedded technology. In other words, if the systems become more integral, secure, and agile with the implementation of an RPA project, An accounting system is defined as "a set of methods and procedures that is used to record, classify, and summarize the accounting information to be distributed to users." These systems' aim is to

record transactions in an organization and then make reports that will later be used by key stakeholders of the organization to make decisions accordingly.

To this end, we present the research question as follows: How does the implementation of robotic process automation in the accounting information systems of companies generally ensure the characteristics of the embedded technology? In this vein, we clarify the main terms of the characteristics of the embedded technology mentioned in the research question. Deriving from the Cambridge Dictionary, "secure" implies "free from risk and the threat of change," "accurate as "correct with the element of integrity, exact, and without any error," and "agile" as "able to deal with new situations or changes quickly and effectively."

We argue that robotic process automation will have a negative impact on the security of accounting information systems, as data breaches happen regularly; a positive impact on accuracy, as there will be no room for human error; and a mixed impact on agility, as the robots can only be programmed to do one task at a time, even if they do it faster.

The paper is organized as follows: Section 1 presents the introduction, and Section 2 provides the literature review. In the same line of thought, Section 3 presents the methodology. Sections 4, 5, and 6 provide the analysis, case studies, and discussions, respectively. At the end of Section 7, the study presents the conclusions, limitations, potential shortfalls, and future direction of the research.

2. Literature review

2.1. Robotic Process Automation

Robotic Process Automation also known as RPA is an automated managerial control tool that spurs productivity inasmuch as it allows user to configure one or more keystrokes representing tasks to be activated in an automated fashion. The bots in this process are used to replace human inputs to complete certain tasks. RPA can deal with many different tasks, such as data manipulation, triggering and executing transactions or processing information.

RPA was developed in the early 2000s and is getting more and more common in the workplace. In the recent years, accounting has been evolving in its implementation, and for a few years, RPA, has been implemented more and more in this sector to conduct the most repetitive tasks. RPA works by interacting with different softwares, "at the user interface level, but it is not intelligent, in the sense that it cannot adapt to changes and cannot make complex decisions" (Lacurezeanu, Tiron-Tudor & Bresfelean, 2020). It is yet to be adapted to Artificial Intelligence, which can learn from its action and human input. RPA can only strictly perform tasks. However, since there is no machine learning involved, RPA is more practical for companies, as they do not necessarily require deep knowledge of programming to configure it. Indeed, as noted by Fernandez & Aini (2018) RPA is an easy-to-configure system where system users running business operations can execute them without programming and users can be trained to independently automate the process in just a few weeks".

Figure 1 is a summary of the main characteristics of RPA, notably, its main advantages, such as working day and night, even during weekends, faster processes which lead to productivity gains and even more secured owing to less human interference.

Trained by the users
Working with the client's user interface
Undertake structured, repeatable computer-based tasks
Works flawlessly with multiple systems
Can link different systems together
Works with different electronic formats
Performs checks and takes in consideration validation points according to predefined set of rules
Identifies exceptions easily
Works 24/7
Logs of its actions are stored inside the program
Provides a case for introduction of analytics
Overall faster processes

Figure 1 Characteristics of Robotic Process Automation
Adapted from Anagnoste (2017)

To complete this list, it is noteworthy to look at the RPA infographic in Figure 2.

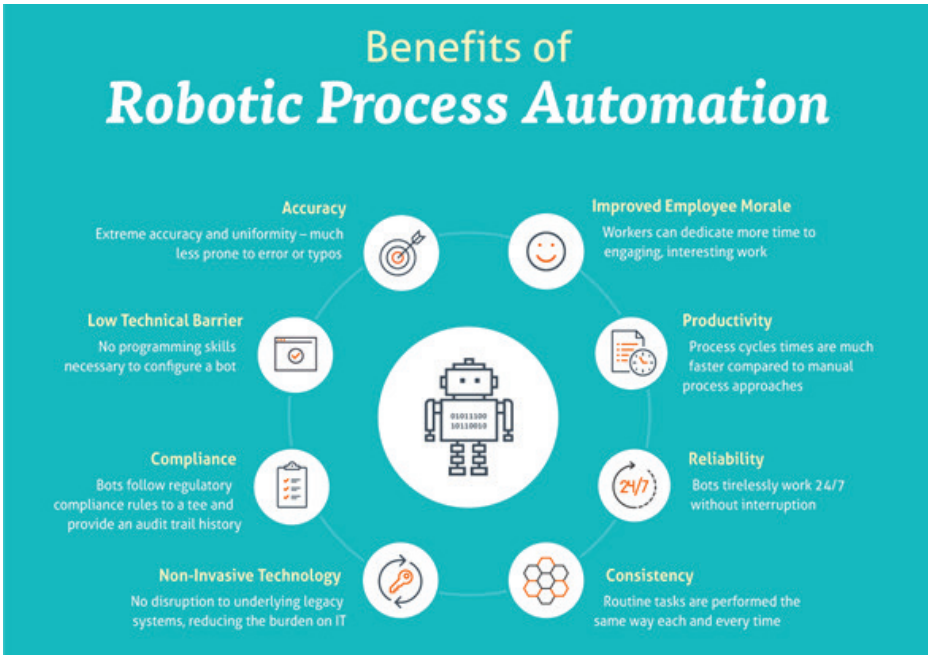

Figure 2. Additional Characteristics of RPA

Constructed per various sources

On this infographic, one can see that it promotes more accuracy, and better employee morale, since they do not have to do the repetitive tasks anymore.

Furthermore, Figure 3 presents a list of the common usage for RPA in the finance department of any company. It is all mostly low-added value tasks, that are often repetitive, but are nonetheless incredibly important for the company.

Automating a report
Reducing the gap between systems
Quality assurance
Cross-checking information
Migration of data
Forecast revenue
Virtual system integration
Invoicing

Figure 3 General use of RPA in the finance department

Adapted from Egiyi & Chukwuani (2021)

Finally, it is also important to note that RPA is a non-invasive technology, that works with already existing legacy systems (Ansari et al, 2019); without the need to create, replace or further develop expensive platforms". (Ansari, Diya, Patil, & Patil, 2019).

2.2. Algorithms of Robotic Process Automation

The algorithmic design of RPA intends to remove the burden of repetitive, low value-added tasks from employees, so they could focus on more high value-added ones. To do so, RPA needs to follow the same "path" a person would take to do a task. In other words, the algorithm that moves RPA technology is based on the premise of automating redundant processes that consider immutable standards. This is such as that of the accounting standards that change very unfrequently.

As an algorithm used to solve the problem of repetitive tasks, the rule-based RPA bots are applicable to mining information across multiple sources. In so doing, the NLP-based algorithm can be trained on standard reports to automatically generate them using the data provided. Support Vector Machine is a widely used algorithm in the field of machine learning (Baharudin et al, 2010). This approach advances RPA in a more logical tasks being automated.

In the same vein, RPA works similarly to a Macro on Excel. Indeed, it either functions by recording human actions on applications during the process, or, alternatively, it can be programmed, through algorithms, to replicate a human process of a specific task,

which will allow the RPA to make the right decisions depending on the task it needs to do. For example, if it is programmed to treat data in an .pdf format, it has to be able to react to other formats and send an error message, without crashing. Finally, to coordinate all the RPAs used in an organisation, there either needs to be an "orchestrator", which is control desk for scheduling and running RPA, usually from the RPA client (such as Automation Anywhere, UiPath or Blue Prism), or the RPA needs to be programmed to be on a repetitive loop.

2.3. Efficiency draw from RPA

The consensus from previous studies is that RPA indeed allows transactions to go faster; the human error factor is diminished, making account closure a quicker and more accurate process (Cigen, 2017). This would mean that companies can benefit from faster response times and be more adaptable when the situation requires it. The implementation of RPA also indicates an increase in efficiency in accounting departments, without necessarily reducing the number of employees (Cooper et al, 2019). According to Vasarhelyi and Rozario (2018), this transition towards RPA would therefore incite a re-imagining of the accounting process. On the same topic, Egiyi and Chukwuani (2021) observed that "the adoption of RPA by firms will be directional to the real duties of accountants, eliminating only accountants and accounting firms who hold tight the traditional method of accounting". This change would therefore imply that accountants who remain will have more specialised roles, such as strategic accounting to support business process towards goal congruence. As they would have more time since menial accounting tasks are already taken care of (Egiyi & Chukwuani, 2021). We could then suppose that these more specialised, strategic positions, could influence the accounting systems. This is further confirmed by Jędrzejka (2019), who says that to date, the automation software solutions required a human to operate them, whereas RPA allows particular tasks to be completely taken over by automata. Therefore, the main advantage of RPA is not the technology itself but the release of human resources and the opportunity to focus on activities requiring judgement, making decisions, or interacting with employe-

es or customers." Workers are now able to maximise their available time during the workday to focus solely on more value-added tasks, which furthermore increase the efficiency gains from using RPA, which already increased efficiency by doing repetitive jobs faster. "All successive automation solutions […] appeared to steadily reduce the burden and costs of monotonous tasks, improve accuracy, and save time thanks to faster processing" (Jędrzejka, 2019).

However, while Robotic Process Automation does increase efficiency, the decision to integrate it in the department should be done carefully, and most importantly well prepared. Indeed, it is important to have already well-defined processes, since they are easier to automate, as automated processes cannot complete tasks that have too much ambiguity to them, and they still require good clear programming to complete tasks (Moffitt, Rozario, Vasarhelyi, 2018). These authors also note that it is quite important for the automated processes to have a high level of repetition, since these tasks are usually the ones that take the most time for the workers, for example, salaries, accounts payable and receivable, since they have a low value-added. And finally, Moffit, Rozario and Vasarhelyi (2018) also encourage automating old tasks, since their processes are already well known and the outcomes are easily anticipated, meaning that there is less risk linked to them.

2.4. Resource Optimisation

There are innumerable advantages that can be attributed to the use of RPA and particularly, its application in accounting processes was shown to have effects on costs incurred in that department. Indeed, "Robotic process automation can create a 25-50% cost savings; enables 24x7x365 execution and, can work error-free, and is relatively costly when compared with human work and capacity" (Kaya, Turkyilmaz and Birol, 2019). And this is not due necessarily to the cost of RPA (which can be expensive) but due to the sheer yield and efficiency of it. An automated process can go three times as fast as a human doing the same accounting task, therefore tripling the possible executions (Kaya, Turkyilmaz and Birol, 2019).

Implementing RPA properly, while the short-term costs of the software are quite high, on the long-term, it is paid back, and more,

by the decrease of salary costs on the long-term (Lacurezeanu, Tiron-Tudor & Bresfelean, 2020). However, this reduction in payroll costs, is not necessarily due to a reduction in jobs, but to proportion of how many new hires would have been needed to achieve this productivity. In fact, automating these processes companies can streamline the entire activity thus reducing costs and error risks". By streamlining automated processes, it is also possible to scale it better to the company size, and therefore achieve economies of scale, as stated by Alberth & Mattern (2017).

Nonetheless, while there has been a lot of positive study and data gathered, it is also important to note that there are some drawbacks, as well as failures. Kokina and Blanchette (2019) observed that "some sources have documented limitations and risks associated with RPA implementation by noting an initial RPA project failure rate of 30 to 50%. They have also noted that sometimes, organisations wanting to implement RPA do not assess the risks of the transition enough, therefore leading to potential failure of the implementation (Kokina and Blanchette, 2019), which could in turn lead to losses for the company.

2.5. Impact on the Workforce

The duality of RPA, towards the workforce is an interest for focusing on more interesting, rewarding tasks, but there is also a fear of being completely replaced. For the impact on the workforce, Asatiani et al (2020) drew on workers' reaction to the introduction of RPA to their workplace. During their research, they have noted both positive and negative reactions. For example, they note that "the informants were quite enthusiastic about RPA and excited to see it in their accounting work processes", however they have also noted that the "Informants were worried about how they would keep track of their workflow if an RPA took responsibility for certain tasks". Another duality they have found out is that some interviewees saw the introduction of RPA to let go of recurrent tasks and focus on more valued-added ones. However, some also noted that it could have an impact on their job security. Another positive that they remarked was that the informants sometimes associated the implementation of RPA with "a reduced risk of offshoring accounting

work outside national borders", since other countries, for example those in Eastern Europe, tend to have lower wages for the same job.

The implementation of RPA could also lead to a drastic change in the way accountants do their work. Indeed, they might need to take on new roles, adapting to the new robots doing their menial tasks, as they would have to focus on completely different tasks (Fernandez and Aini, 2018). These same authors found out that the accountants impacted by the implementation of automated processes, have actually increased their efficiency at work, since their routines have been diminished, and that the financial statements as well as the management analysis are more qualitative.

Finally, Santos, Pereira and Vasconcelos (2020) note that this change provoked by RPA might even create new jobs in companies, such as "robot management, consulting and sophisticated data analytics". Also, RPA could lead to a "Creation of new tasks for the workers, leading to more job load, as robots need to be supervised", and therefore they would not have as much time to focus on more value-added tasks.

2.6. Possible Challenges and Limitations of RPA

While RPA does seem to have its clear advantages, it is bound to have some limitations as well. Indeed, since RPA is a rule-based automation system, "not every process is predestined for RPA--based automation, [and] identifying suitable processes can be quite difficult" (Herm et al, 2021). These same authors also note that the crafting method of RPA is outdated, as it relies on "handcrafted flow models and rulesets", which makes the programming period quite time-consuming for the company. It is also important to note that RPA is a young topic, and therefore there still is not a lot of seniority on the matter, yet, which means that the designers of such process can sometimes have limited knowledge and ability. So, there may be a cut-off point at which RPA development becoming inefficient due to the large and complex variants and rulesets to be considered.

Another challenge that arises for RPA is the topic of cybersecurity. On the topic of security, Willcocks, Lacity & Craig (2015) have noted that "with cloud computing there are still genuine security and privacy challenges that have to be worked through. Denoting

that there is still a lot of work to do in this area, since RPA is still relatively new, and therefore companies should be careful when implementing them in their processes while releasing access authorities. Indeed, since the implementation of RPA completely digitalises the process, it is therefore more easily accessible to hackers, as it relies solely on digital channels (Jędrzejka, 2019). Meaning that this is also true for RPA enhanced by Artificial Intelligence, and that hackers can also have access to AI to hunt data. Gotthardt et al (2020) RPA technologies are more prone to data leaks than tasks done manually and, robots "are not different from other IT systems and countermeasures are readily available and under continuous development. We can therefore assume that cybersecurity, while a risk, is not a major one, as there are measured already taken. It is also important to note that data leaks can happen from word of mouth as well and has been for a long time so, awareness is necessary.

Kosi (2019) compiled a list of possible security threats. The main ones he denotes are making use of a bot's privileged access (since RPAs need to have access to certain data to be able to work properly), the programmer of the robot making use of the robot to leak information (or mistakenly doing so via bad development of the bot), and finally, not making the robot receive and send data that is encrypted. To counteract these security risks, the author proposes the RPA best practices compiled by Cigen (2017). These contain for example, making sure that an RPA only has access to what it needs to, and not all data and/or making sure that all data that the bots use are encrypted, to avoid exposition to outside sources.

After testing different RPA tools, such as UIPath, Automation Anywhere and more, authors Agostinelli, Marrella, and Mecella (2019), have identified a main challenge with RPA: it is still in the very early steps of self-learning. Indeed, now RPA is only able do what it is programmed to do but is not able to learn this information. For example, RPA can report anomalies (such as an invoice with a value of 0), since it can be coded to so, but it cannot be programmed to seek the source of the problem, since it cannot learn from past actions. Indeed, RPA is still only for routine tasks (Alberth & Mattern, 2017).

Another issue that could be raised about RPA is on the accuracy of the processes. Indeed, while a robot does not make mistakes if well programmed, they can still be given wrong information from the start. Santos, Pereira & Vasconcelos (2020) raise this question and say that "As there is no human checking before executing a task, the robot can make mistakes faster, not waiting for the responses from the applications, like a human would do and not being able to check connection problems, performing only a part of its tasks." This signifies that an RPA would not know if it has made a mistake, and it would continue without stopping, possibly creating more problems down the line, contrary to a worker, who would realise they had made a mistake, and would not repeat it mindlessly.

Another challenge of RPA is its sustainability. Alberth & Mattern (2017) note that to "implement RPA as a sustainable tool of your management system, you should expand your framework by a process to systematically detect all use cases in your environment that can potentially be automated by RPA". While this is good idea, it is also a costly one, as each automated process needs its own licence to work, which is a yearly fee, to function. This would also require a lot of time spent on crafting processes to automate and hiring professionals who can do it.

And finally, a last challenge pointed out by Santos, Pereira & Vasconcelos (2020) is that RPA could lead to an unhealthy "competition between robots and humans", as there is no possibility that a worker could be as productive as an RPA at the same tasks. This could also lead to a worse work environment and therefore either an increased in employee turnover or a decrease in productivity.

2.7. Future of RPA

While the intelligent automation of tasks has been discussed at length, the combination of RPA and AI in automated processes is still not quite developed (Gotthardt et al, 2020). Some RPA companies, such as UIPath, are starting to try to link Robotic RPA with AI, but their solutions are still not powerful enough for complete automation with machine learning. Only 15 percent of companies consider themselves to be mature in their use of RPA, and only 5

percent in AI" (Gotthardt et al, 2020). This means that there is still a long way to go from there.

The integration of AI with RPA would be extremely useful in handling more difficult business processes, by overcoming the limitations of rule-based processes (Santos, Pereira, & Vasconcelos, 2020). Ansari et al (2019) concur with this by saying that RPA is still growing and will be starting to implement other technologies other than AI, such as "intelligent optical character recognition, machine learning, big data analysis voice recognition, [and] pattern analysis". RPA is still far from its limits and will only continue to grow from here.

Overall, one can infer that RPA has many advantages, such as increased efficiency, potentially reduced costs, and even more accuracy in processes. However, it is not an easy transition, and requires good implementation and governance in the company to implement well and reap the most benefits. We can assume that Robotic Process Automation will indeed have an impact on the main three aspects of this study: security, accuracy, and agility. It is quite normal to believe that accuracy will also be positively impacted, since robots are not prone to human error. And finally, RPA might have a mixed impact on the accounting system, as while RPA is able to work 24/7, one robot can still only do one task, so it limits its versatility.

3. Methodology

The methodology adopted is interpretative, a constructivist perspective levied on the narratives of 6 experts. This is consistent with the use of this approach in information systems and technology research. This is also consistent with the qualitative research studies depicted in King (2004) and Imoniana et al (2022).

Over the last decades, the notable increase in the number of qualitative publications in leading IS journals gives testimony to this development (Cheon et al. 1993; Galliers 1993; Mingers 2003).

The data collected during the months of March through July 2021 for this study involved six experts on the implementation of RPA, representing each case study. According to Yin (2009) and Crowe et al. (2011), these are iconic cases drawn upon in this study. Furthermore, we conducted in-depth interviews with professionals

working with RPA in accounting with the goal of gathering their firsthand knowledge of RPA implementation in their respective organizations. In Table 1, we have included the demographics of the respondents.

Table 1 Demography of respondents

Respondent	Gender	Age	Experience	Profile
VLG	M	49	3	Chief Financial Officer in a technology consulting company. He is, and has been for a couple years, implementing RPA in his teams in accounting.
PE	M	36	3	An Account Partner at Salesforce, who previously worked at an information technology services and consulting company and focused on digitalisation, including the use of RPA.
ST	F	38	4	Senior Data Analyst in a Food and Beverage multinational company. She has worked with RPA for a few years and has done some implementation of it in accounting.
NJ	M	41	4	Accounting Director at an engineering consulting company. Him and his department have been implementing a lot of RPA solutions, and have plans to continue doing so.
RE	M	37	2	FP&A director at a security company. They started using RPA solutions recently and have been pleased with results and have plans to do a lot more in the future.
GS	M	42	5	Manager of RPA Factory at an international cosmetics company. He has worked closely with RPA for about 5 years, with all departments of the company.

Also, to assist in the data construction, we have adopted an interview guide. Some questions were added during interviews based on the answers that were given during conversations with the

interviewees, therefore, enhancing the flow of dialogue to construct the corpora.

As in Table 1 six professionals were interviewed during this study, with differing backgrounds in order to not skew the results by cases. The first interviewee was VLG, the CFO of a technology consulting company. He is implementing RPA in his teams. The second one was PE an Account Partner at Salesforce, who previously worked at a technology consulting company and focused on digitalisation, including the use of RPA in the finance sector. The third interview was done with ST, a Senior Data Analyst at a Food and Beverage company, who works closely with RPA and has implemented it in the finance department. The fourth interviewee was NJ, the Accounting Director at an engineering consulting company, and he has implanted RPA in his departments. And finally, RE, an FP&A director at a security company, which started implementing RPA recently and is looking to increase its use in the company. These case studies will be the basis of the analysis done in this study.

Case studies are a type of research that draw information from events. Yin, a notorious researcher known for his work with case studies, defines them as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2009). In other words, case studies are generally used when wanting to research real situations, giving accurate information to not only the situation, but also its context that could be important later on during the analysis. He also identifies 4 main steps during research with case studies: design the case study, conduct the case study, analyse the case study evidence, and develop the conclusions, recommendations, and implications (Yin, 1994). However, other authors have different methodology, such as Stake or Merriam. In the case of Stake, he has no specific methodology, and each case study can be approached differently (Stake 1995), while Merriam recommends another step-by-step approach: "Conducting a literature review, constructing a theoretical framework, identifying a research problem, crafting and sharpening research questions, selecting the sample (Purposive sampling)" (Merriam, 1998). What we can gather from these authors is that there is no one way to

conduct a case study, but most of them recommend using a clear methodology, so as to make the analysis more precise and concise.

For interview-based research, the aim is "to find out what is on someone's lived experience. We interview people to find out from them those things we cannot directly observe" (Patton, 1990). According to Hannabuss (1996), it is important to note how formal the interviews are, to see whether there will be open questions during the interviews, or if the interviews are already prescheduled, and will not deviate from the guide. Both these authors (Patton, 1990 & Hannabuss, 1996) agree on saying that the rapport created with the interviewee is very important to getting the information desired for the research and cannot be overlooked.

On the other hand, case studies focus more on the gathering of data of a specific situation with context clues, and the analysis, which are usually more consistent through interviews. All in all, case studies with interviews do share the aims for in-depth, such as the aim of gathering qualitative data that focuses on the experiences of respondents.

4. Data Analysis

We base our analysis of the data gathered from the case studies of the professionals' lived experience on the main themes that emerge from the data gathering under the umbrella of the financial aspect, the impact of RPA on security, accuracy, and agility. The subthemes, otherwise, subcategories, follow suite as per Strauss and Corbin (1990) as we elaborate on each category. In effect, the emphasis is placed on three areas that address the research question: the impact of RPA on security, accuracy, and, finally, the agility of accounting systems.

4.1. Financial aspect

Cost savings

Most companies nowadays use Enterprise Resource Planning (ERP) software, such as SAP or Oracle. These ERP are usually costly software that have multiple fees for the maintenance, being the initial investment, the rent of the software, the add-ons that are

necessary for the company and many others. These are constant costs that need to be paid periodically. Sometimes companies need different ERP software for their different needs, so the costs can quickly add up. ERPs usually have built-in solutions to automate certain repetitive tasks, but they are stuck on the application, and cannot communicate with others. For example, SAP could automate a transaction, but it would stay on the software, and would not be able to communicate the information with Microsoft Excel to input it. The aim of RPA is to allow this communication between different applications. However, RPA does have its fair share of expenses.

According to NJ:

"The investment for RPA is substantial at the beginning […], you have to structure the project well, either with service providers or internal developers, there is a subscription, the licences for each robot".

This is also confirmed by VLG, who said:

"There's also a problem of resources, it's quite expensive at the beginning to start with automation."

From these statements, one can infer that RPA has very high investment costs, which is due to several factors: each robot needs a licence from an RPA service (such as UIPath). At least one coder (which can either be internal to the company and needs to receive a formation from the service provider, or directly from the service), and time to clearly define the processes that need to be automated (the number of steps taken, the exceptions to the process and more). The main question for the company is the cost-benefit analysis of RPA, to see if the costs of the beginning period are not too much, compared to what they can expect in return, from both a financial standpoint and a time saving standpoint, which can also be financial, since it could lead to more tasks done, which generate revenue for the company.

Time Savings

On the other hand, once the project is already started and well on its way, the return on investment is considerable.

"The ROI is quite substantial, quite quickly, if the robots are well coded, and if the employees use the robots deployed at their disposal" (NJ).

Moreover, the use of RPA can free up time for the employees that do not have to do their repetitive tasks themselves anymore, to do other, more important tasks. During, our interview, ST, Senior Data Analyst, shared an RPA request; Figure 4 - "example of RPA request", with sensitive information greyed out).

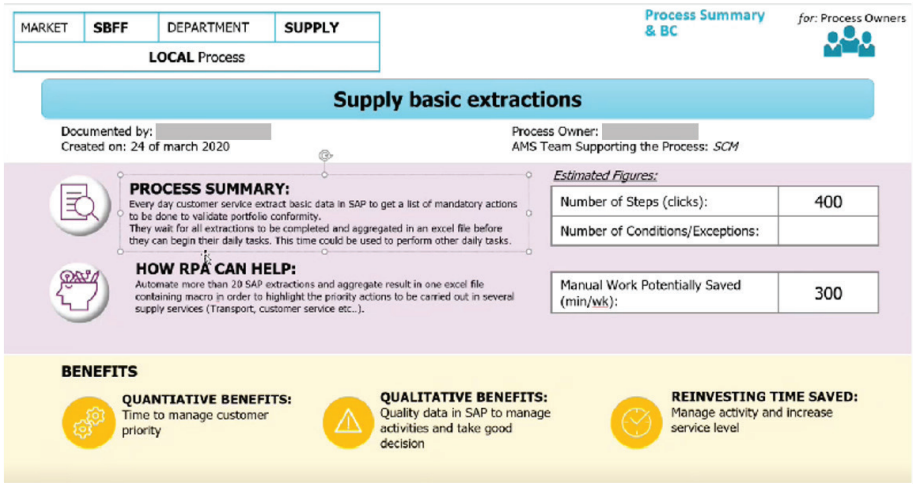

Figure 4 Example of RPA request

In it, we can see the time saved by one process automation (as well as the number of steps for this process). This time saved allows for employees to focus on other tasks, usually ones with more added value and that cannot be automated.

"It is up to the manager to use the time saved by the robots to put the employees on other projects, in order to maximise the time saved, and the ROI of the RPA" (NJ).

Meaning that if the management does not manage the time of their employees properly, thanks to the amount of time they saved due to RPA, the savings will not be that noticeable. However, managed properly, RPA will indeed by a consequent money saver.

As said by RE:

"The money saved by going through an RPA solution is pretty crazy".

From all this, we can gather that indeed, looking on the short term, going through the implementation of robotic process automation can be quite expensive at first, seeing that there is a lot of investment, in both time and money. However, on the long term, if the project is done correctly, as well as managed correctly, the return on said investment is worthwhile for the company.

4.2. Impact of RPA on the security

Cybersecurity

We had previously defined security as "free from risk and the threat of change for the worse" (Cambridge Dictionary). With the digitalisation of everything, there is an emphasis on security, and who has access to what information. For RPA, this translates to robots having restricted access, with unique identities, to information, so that they can only access what they need to, to do their own tasks.

ST tells us:

"In our organisation […] the rule for RPA is we can only give it permission to the exact table and systems it deals with. So, we couldn't give it access beyond what it is meant to do".

This means that the robot cannot do anything that is not related directly to its designated task, and therefore ensures its integrity. This is later confirmed by GS, who says:

"We have UAM [user access management], so each time we create a role in a software program with which we are going to work […], we make

sure that the roles that are created are totally separate. A robot cannot create an order, approve it and process an invoice and pay it, otherwise it has too many rights".

Another issue that seemed to arise was the question of whether the RPA could deviate from what it is supposed to do.

According to RPA expert ST:

"Unless someone forces RPA to do something else, it can never do anything beyond what it was programmed to do".

With this, we can assume that once an automated process is coded, it cannot stray from its designated path. However, there is also another solution to double check the security of RPA.

"Now we make robots, on our robots, to check that the robots are well configured". (NJ)

This means that not only the robot cannot do what it was not coded to do, but it is also possible to program another robot to verify their tasks, to make sure that there is no problem.

Some organisations even organise test periods to see what would happen if hackers were able to get in the organisation's network. About this, GS explains:

"We do [penetration tests] regularly to see what could happen if someone breaks through the company's firewall from a user who doesn't have many rights. […] The aim of these tests is to confront 'nice hackers' who come and put us under stress".

These cybersecurity tests allow organisation to see the extent of damage that could be done by a hacker, if they ever got through their firewall and took control of an RPA user ID, and make sure that their infrastructure is safe from harm.

From this information, we can assume that RPA networks are well controlled domains, and that there are no more added risks to hacking or other data breaches, than before the use of RPA. However, depending on the organisation there no precautions to be taken to ensure the safety of data. Only the fact that less people internal to the company will have access to the data, since they will not be working on it, as the robots are doing it instead. Therefore, we can assume that cybersecurity, while still important, is not much impacted by the use of process automation in the company, but it still overall a positive impact.

Compliance

A big concern with the automation of process with RPA was on the control part. How do we control whether the work is done properly or not?

In the words of ST:

"From an internal audit point of view, we had to make sure that RPA left the same kind of logs, so that we can see exactly what it was doing".

These logs ensure that the actions done by RPA has traceability, which means that if there is a problem it is always possible to go back to see where it originally came from.

ST also added:

"Control is always going to be critical, but RPA has its pros and cons: from a positive sight, RPA always leaves logs in the systems that were used [such as SAP], but also for the RPA system itself, so we have 2 logs if anything comes into questions, in a way it's better than relying on human memory".

To add on the control part, RE says:

"Clearly an auditor will always prefer an automated process to a human process. The automated process, when it is well done, is less prone to error".

This signifies that auditors might prefer to audit automated process, as the logs available to them and the general accuracy makes it better and faster to control.

Gartner, a technology research company, made a table about security with RPA (see Steps to ensure RPA security from Gartner in the Appendix). On this table, we can see that the steps mentioned are very similar to the ones that were discussed with the interviewees, therefore we can say that they have taken the right steps so as to make sure the security of the system is respected.

With this information gathered, we can assume that the impact of Robotic Process Automation on the security of the accounting systems is quite positive, as the robots need to have restricted access to data and other software, they cannot do what they are not programmed to do, so they will never be able to deviate from their functions, and finally, they leave logs of their every actions, so that control can be done more easily, and rapidly.

4.3. Impact of RPA on the accuracy

Program Precision

The main point of Robotic Process Automation is to get the tasks done faster. Notwithstanding, a great gain comes to play with the precision at which the transactions are processed with minimum errors. As defined previously, accurate is "correct, exact, and without any mistakes" (Cambridge dictionary). The main question therefore is whether RPA is more precise than humans, when doing the job.

Bill Gates once said "The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency." This translates very well to an example that was given by VLG, where he told us about an RPA in-charge that oversees invoicing. It was supposed to put invoices in a directory classified by months and year, but the

date in the code for it was hard-coded (meaning that it was written a specific month and year instead of a variable).

VLG, concerning his previous example, after launch:

"When the thing crashed between August and September, we were good to send an apology email to 60 people in my organisation".

The lesson to learn from this is that the coding is the most important part of the RPA, since one single error can completely render it useless, and create more problems.

This is confirmed by NJ:

"This solution seems limitless, as long as it is well organised and well-constructed, it is extraordinary".

While process automation does seem to have some issues with accuracy, the main problem comes from the initial phases of the development.

Indeed, RE tells us:

"We have never had any problems with the [RPA] solution. We spend a lot of time testing too", and adds *"There are rarely errors, when there are, it's because the information provided to the robot was wrong. We have never had a case where the robot itself was wrong".*

This information is confirmed by GS:

"*The robot can handle anything that is managed by rules. [However] you have to anticipate exceptions, such as data which does not exist, or bad formats".*

The main takeaway here is the user testing done in the first stages. It is indeed quintessential if the organisation wants the RPA solution to function properly at launch.

On this topic, ST says:

"User testing is critical before we go-live with the bot".

User testing allows to verify that it does what it is intended to do, and more importantly, that it does not crash for no reason when it is launched for the first time.

From these, we can say that Robotic Process Automation brings more accuracy to the table, as there is no room for human error, if the development of this tool is done correctly, from the early stages to the end, from the analysis of the process to the user tests.

Technical difficulties

RPA guarantees the accuracy of the program because it cannot deviate from its task, what it was programmed to do. But, after the problem of precise coding is out of the way, another issue comes up. Since it is software, like any other software, sometimes there will be bugs and other technical problems linked to said software. While those are usually rare, they can still happen.

About this, NJ tells us:

"Once the project was well underway, we saw a small gain curve, and above all many technical problems, crashes and access problems".

These can be very problematic, especially when a lot of the tasks are automated. This is confirmed by VLG, saying:

"Once it's launched, there are no errors. If there are, it's a programming error, […]. On the other hand, there can be bugs, and when it crashes, it's violent".

This signifies that these issues gain in magnitude, compared to when a mistake is made by human hands. Unfortunately, while RPA does make tasks more accurate, simply by removing human error from the equation, it is not fool proof, and can make errors

by being fed wrong data, or just by crashing like any machine can.

From all these points, we can gather that there are some mixed opinions about accuracy. Indeed, the consensus between these professionals seems to be that RPA is accurate, but only if it is coded properly in the initial phase of development of the automated process, it is very well tested during the user testing phase, and there are no bugs or crashes of the software. However, once these conditions are met, the RPA never makes mistakes, as it is less prone to error than the human mind.

4.4. Impact of RPA on the agility

Ease of automation

We will now move on and finish this analysis with the impact of the agility of RPA on the company. We had previously defined agility as "able to deal with new situations or changes quickly and successfully", thanks to the Cambridge Dictionary. Two case studies told us that the finance department of the company has many tasks that are easy, or at least easier compared to other departments, to automate.

Indeed, PE says that: *treasury and some parts of accounting are easy to automate, however he notes that accounting, while it can be automated, needs to have proper security measures (such as logs, for traceability), as they need to be credible for both the company, and auditing).*

ST also tells us:

"In finance you usually have the processes laid out: process this data, copy that into excel, etc. So, when you explain it to the developers, its already a proper process".

She compared it to marketing, for example, where processes are not usually as streamlined, making it that much more difficult to explain for automation purposes. With this we can gather that

programming RPA for the financial department is not necessarily as hard are as time-consuming (and therefore costly) than in other departments of the company. Another part of RPA that makes it agile, according to GS, is that the projects are usually relatively short, if the organisation has a dedicated task force for RPA, which allows them to automate many different processes. Indeed, GS tells us:

"What I like to say is that we bring agility to the company, especially because to do robotics, we try to build a project portfolio. The aim of robotic projects is to go very quickly, these are projects which last between 6 and 10 weeks".

This ease of automation for some processes, especially in the finance department of the company, means that the potential for automating tasks could be limitless, and therefore allow the company to automate whatever it wants, leading to more versatility of the RPA.

Managing the agility

The main point that needs to be raised in terms of agility for RPA, is that it is software, and therefore just a program running on code.

"Add to that the fact that each and every robot needs a licence to function, it means that an RPA cannot do more than one task, and especially not at the same time, even if it was programmed to do two" (VLG).

However, RPA can work at any time of the day, contrary to employees, and therefore some processes can be run during the night and save time for the company during the workday.

As said by ST:
"Some processes have a hard deadline, [it's] very useful when the bot can do the work for you overnight".

NJ adds:

[It helps] "to plan our work, for example our robots work when they are asked to work. They can work at night, at 3am, and save us time during the day".

However, while this versatility can be great for respecting deadlines and free up work during the day, it can also be detrimental, depending on the time it is run.

VLG tells us that

"If it occupies SAP at night, well it can conflict with the backup periods, while you are not supposed to act on the data".

This could cause some crashes and corrupt data if both RPA and backups clash. Therefore, it is very important to verify when the RPAs are running, to avoid conflicting schedules with other tasks being done at night.

As said previously, having automated processes also makes more time for employees to do more value-added tasks, since the RPA take care of the repetitive, low-added value ones.

Indeed, RE told us:

"Employees today are doing more interesting tasks, with more added value, with less redundancy", and this led to "employees […] becoming more competent thanks to this".

Therefore, from this time save, which translate to money savings as well, companies can also expect employees to become better at what they do, since they have more time to dedicate to harder, more interesting tasks. With all the tasks that need to be done in organisations, to make sure that they automate the right processes and the most important ones first, GS explains:

"We do an analysis in the qualification phase that takes into account costs, benefits, complexity, whether it's qualitative or quantitative".

This allows organisations to make an order of priority if there are a lot of processes that they need to automate and helps them in managing the agility that it brings to the table. However, one on the main drawbacks for the agility of Robotic Process Automation is that every time a process changes, they need to be updated. This can range from having to add a new employee to the mailing list of a report done by RPA, to a complete overhaul of the process because of a new software that is implemented.

On this subject, ST says:

"What we need to keep in mind is that once you automate a process with RPA and it goes live, it's not over, it needs to be updated often".

This means that the work being on the automation never really stops, as there will always be some adjustments that will need to be made for it to function according to the company's expectations. In conclusion, we can see that the impact of RPA on the agility of the accounting systems, is quite mixed, but leaning on a more positive note, since they can allow to work at any time, make employees free to do much more important tasks for the company, and are apparently not as hard to apply to finance. The main drawbacks of automation seem to be the licences, which limit the amount of work that can be done at the same time, and the need to regularly update the robots, which leads to some downtime of the RPA.

5. Case Studies

5.1. Case Study 1 – VLG – Alten

Alten is a French company, working internationally in consulting on both technology and engineering. It has more than 30 000 employees, with offices in about 25 countries. They started working with RPA 3 years ago, and started with the finance department of the company, when the CFO heard about the solution.

VLG is the Chief Financial Officer in a technology consulting company, Alten. He has been working with RPA for a couple of years, trying to implement it in his teams. He is the one that first

brought up RPA in his company, and later helped in founding a skill centre for RPA in Alten. He has, for example, launched an RPA that takes care of invoicing clients automatically, and classes every invoice in a directory by date. In total, they had 5 RPA working in his team that were developed and implemented since 2019. The first and most important impact of RPA he pointed out was the time save it allowed: indeed, he noted that some bots they had saved them as much as ten times the amount of time it usually took to do the tasks themselves manually, which allowed them to have more time devoted to other, more value-added tasks. Then, he goes on to talk about the accuracy. He says that if an RPA is programmed correctly, there will be no errors, but there still can be bugs, as any software can have. He however points out that making programming errors can be both time consuming and costly, if things go very wrong, such as when the RPA he gave as an example had a coding issue that put every invoice on the wrong date, which caused them to send apology emails to clients and redo the work manually. All in all, he thinks that RPA is a very important step to increase efficiency, as well as accuracy, in a company, but it must be done carefully, as mistakes in programming can be costly (both in time and money).

5.2. Case Study 2 – PE – Salesforce

Salesforce is an American company, working internationally focusing on cloud-based software. They have more than 50 000 employees. PE started working with RPA in previous jobs, and continued with automation at Salesforce, as it is one of the services they offer.

PE is an Account Partner at Salesforce, who worked at an information technology services and consulting company before, and has focused on digitalisation, including the use of RPA for 3 years. He begins by first saying that RPA is a bit of a misnomer, which can sometimes scare people with the implication of "robots", as it is just software. After this, he explains which accounting operations are usually automated, and divides it into 3 main parts: registration (scanning and capturing information), which is usually easy to automate, sorting information, which can be automated, and validation, which would be very risky to automate. Validation is

theoretically automatable but would pose a problem with reliability of information since we generally require the help of an expert for this part. Therefore, automating it and having someone check afterwards would be quite useless, according to him. He later denotes some other issues with RPA, such as an issue with accuracy of information, since 1 error with a completely automated system could have ramifications, or an issue with security, notably auditing, since many firms do not know what to do in every situation, and finally an issue with agility, since multinationals tend to want to automate more, they run into the problem of different accounting norms (IFRS, GAAP, etc.) which would need to adapt their RPAs to each region. All in all, he sees a lot of potential with RPA but denotes a lot of possible issues that come with it and that cannot be ignored and therefore need to be considered when implementing it.

5.3. Case Study 3 – ST – Suntory

Suntory is a Japanese multinational Food & Beverage company, with both alcoholic and soft drinks. They started working with RPA four years ago, because they wanted some of their processes to be more efficient. They now have dedicated teams to implement RPA.

ST is a Senior Data Analyst at Suntory, a food and beverage multinational company. She has worked closely with RPA for four years and has previously done some implementation of it in accounting. She is responsible for strategizing and implementing new digital solutions, which can change business processes. Her role is to test RPA in different parts of the company, including finance and accoutning, and to see whether they are applicable to the organisation. She had an RPA that worked between SAP and Excel, where data was taken from different parts of SAP, put into excel to run some calclulations and then put back into SAP with the results, as well as a report sent to the people that needed it. This particular RPA was a bi-monthly process. She later explains that the time saved by inclunding RPA in the organisation has been very well received by employees, as they now have more time to do less tedious tasks and in general less overtime as well. However, she notes that this time can only be saved if the RPA are working well, and that they had extensive user testing done before going live with the bots, so as

to avoid later problems. User tesing generally includes testing what happens when wrong data or wrong file formats are used with the RPA, to see how it reacts. About security of RPA, she tells us that the most important part is the access RPA has. Which data it can access, which applications, and that they avoid giving bots access to everything, in case of security breaches. RPA always leaves logs, so that they can trace what went wrong, and where, in case problems arise. After that, she tells us that RPA, especially in finance, is not that hard to program, in general. For finance processes, they are usually more streamlined to other departments', and therefore have more ease of automation. However she points out that RPA, as human processes, sometimes change and that they need to be constantly updated to keep up with the expectations of the organisation. All in all, ST thinks that RPA is very valuable in a company, if tested properly and kept up to date.

5.4. Case Study 4 – NJ – AKKA

AKKA Technologies is multinational company, working internationally in technology consulting and engineering. They have more than 20 000 employees in offices all over Europe and North America. They started using RPA four years ago, and started with the finance department, when they heard about it at a conference.

NJ is the Accounting Director at AKKA group, an engineering and consulting company. Him and his department have been implementing a lot of RPA solutions for the past four years and have plans to continue doing so. He is the one that brought on RPA at his company, when they first started with external contractors to do it. After a few attempts with mixed results, they decided to train internal employees to the automation in-house, which yielded better results. An example he gave us of RPA in his department is one that paid expense reports for employees. They have 6 000 employees and do this twice a month, which can add up to 12 000€. The employee in charge of this used to take around five days a month (so two and half days each time) to do this task, and now the RPA does it in one afternoon (for the whole month). He notes that the time saved opened a lot of time for his employees, with all the RPAs they had working, but that it is very important for managers to manage this

newfound time properly, so that more tasks could get done. After that, he says that once the time is managed properly, the money saved transcends by far the initial costs of the implementation. Afterwards, when asked about security, he said that they now make robots on top of robots to check that everything is functioning correctly. About compliance, he said that their auditors do not care about their implementation of RPA and haven't asked questions about it. All in all, NJ is all on-board for automatization but really stresses the importance of managing the time saved to maximise the return on investment, due to the high investment necessary at first.

5.5. Case Study 5 – RE – Verisure

Verisure is a home security company, previously known as Securitas. They work in most of Europe and some countries in South America. They started using RPA about two years ago, because they faced rapid growth in client base and needed to be able to improve efficiency without hiring massively.

RE is the FP&A director at a security company, Verisure. There, they started using RPA solutions recently, in the past two years, and have been pleased with results and have plans to do a lot more in the future. His role is to structure all the company's financial processes, which is like management control at group level. He gives us an example of RPA, which does the invoicing for clients regularly for new products and services. After giving this example, he notes that RPA saves them a lot of time, but mainly money. He calls it cost avoidance, as using RPA to do the invoicing has allowed the company to limit the number of new hires required to keep up with the growth of the client base. He then explains that the robots never make mistakes, except if the data they are given first is wrong, but therefore they are not inherently wrong themselves. However, to make sure the robots work properly, the did a lot of testing beforehand, to avoid any trouble later. Concerning security, he points out that their auditors usually prefer working with RPA, as they just need to look at the program when it's first implemented, and do not need to check it later if there are no problems with it. RPA also allows them to work faster, as they do not have to follow paper trails, according to him. All in all, RE notes a lot of time and money savings from the implementation of RPA, as well as faster and easier auditing.

5.6. Case Study 6 – GS – L'Oréal

L'Oréal is a French multinational company, focused on cosmetics and personal care. It has nearly 90 000 employees, and an "RPA factory" with a dedicated team working with other services in the company to automate their processes, to increase efficiency as a whole.

GS is the Manager of the RPA Factory at l'Oréal, an international cosmetics company. He has worked closely with RPA for about 5 years, with all departments of the company, including accounting. The RPA factory is a service for other employees, when they can give ideas for which processes could be automated in their department (not limited to finance). Then they do a cost/benefit analysis, to see whether an idea can be turned into a project, and then a working RPA for the department that requested it. According to him RPA projects usually last between six and ten weeks. He gives us an example of an RPA programmed for the accounting department, where the robot had to verify the VAT codes of their products. Every month the RPA checks the supplier base (there are more than 70000 suppliers) on the European Commission website, which allows the existence of a VAT code to be verified. This allows the company to ensure that the suppliers who are in the bases all exist and that they don't risk having problems when they submit VAT returns. According to him, this saves a trememndous amount of time, because this task takes so much time that some organisations do not even do it, even though it is supposed to be mandatory. Later on he talks about the accuracy of RPA in general and notes that they never make mistakes, but can only work within the confines of their programming. For example, a robot will never be able to work with data it cannot read, or format it does not recognise, which causes some limitations. After that, he tackles security and compliance, and points out that they do a lot of cybersecurity tests to see what could happen in case of a data breach. About compliance, he says that they use User Access Management, so that each robot does not have to many rights. He finishes by saying that the agility of RPA resides in its speed of programming, as they can really tackle a lot of projects and create many robots that can work together. All in all, GS thinks that RPA is an imoortant step for a company that makes them more agile, if they have a dedicated team for RPA, but they have to take cybersecurity very seriously.

6. Discussion

Based on the findings, the impacts lie on the cost of implementation of RPA, tracking and mapping of security, accuracy of transaction processing and gained agility. It is worthy of inference that the impact of RPA is not far-fetched when one discusses the elements summarized in Figure 5. With appropriate planning, RPA uses infrastructure that can be easily paid back considering the investment analysis and the benefits accrued, such as time savings and cost reduction. It allows one to speculate about an agile AIS that also allows easy system integration with other ERP modules. It makes it manageable by allowing the PDCA framework to keep track of the systems. The people who manage those projects should make sure that they have the right developers working on them, as well as continuous testing and maintenance, to ensure accuracy and efficiency from the robots.

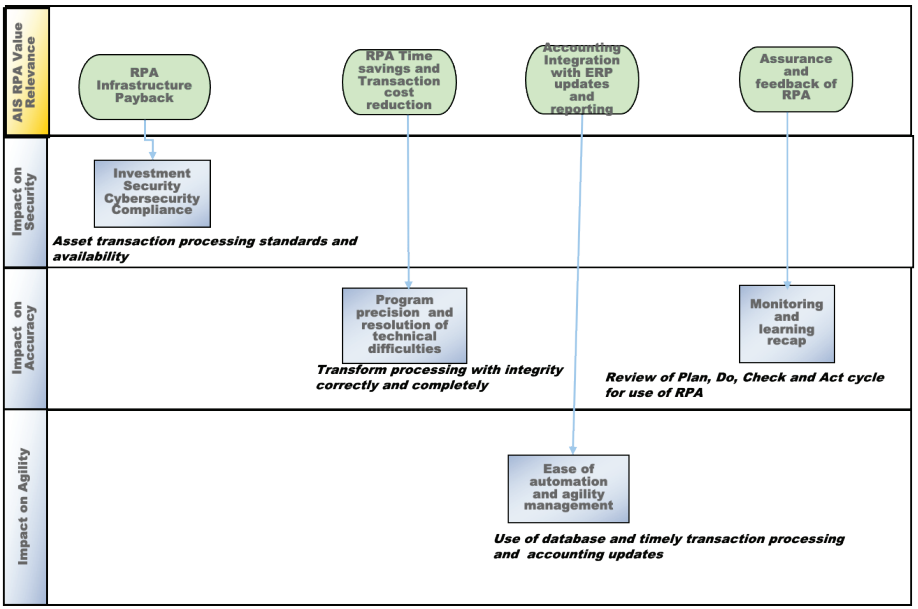

Figure 5 Summary impact of Robotic Process Automation on Accounting Information System

In the six cases studied, we can easily point out some similarities. Indeed, those who mention costs agree that while the initial investment is quite steep, the return on said investment is high,

therefore needing meticulous project planning and implementation. This can be seen in both the efficiency of RPA and the time savings, which can be reallocated to other tasks for employees to do. Consider turning canning jars upside down to seal them: to secure the seal, the jar is inverted upside down and allowed to cool for several minutes before being placed right side up. In the same spirit, another agreement between the cases is the impact on accuracy: RPA does not make mistakes, with the caveat that it needs to be programmed correctly and tested extensively. However, the most divergent point was security, both in terms of cybersecurity and compliance. For cybersecurity, some said that it did not change much from before, while others said that they tested the resilience of their system more often. For compliance, some said that auditors did not care about the new implementation of RPA in their organizations.

From the analysis of these case studies, drawing from Asatiani et al. (2020), we can see that there are some divergences when the issue of impact on the workforce comes into place with the implementation of RPA, although they are not exaggeratively negative. Indeed, we initially believed that robotic process automation would have a negative impact on overall security due to the ease with which potential data breaches would occur if an organization used more RPA.That turned out to be somewhat untrue, as organizations tend to take more precautions and do more testing for cybersecurity. For accuracy, we thought RPA would have a positive impact, as there would be no more man-made mistakes. While this is true, this did not consider the potential bugs and crashes that software is prone to or the fact that RPA can be given the wrong data to start with, which makes mistakes only grow bigger, even if this scenario is rare. And finally, for agility, we argued that RPA would have a mixed impact. This was mostly correct, but tends more towards the positive, as while robots can only do one task at a time, they do it faster, leaving more time open for employees to do other tasks. Smaller RPAs can also collaborate on larger tasks, providing greater agility to information systems as a whole. All in all, robotic process automation does seem to have a positive impact on all three aspects studied, some more than others, with the only barrier being the high initial investment for implementation.

In this sense, and in accordance with the positioning of this research and its interpretations, RPA exists in an environment of

resource complementarity toward a common goal, as it relieves users of repetitive tasks and promotes a more strategic workforce relocation.

The potential shortcoming of this interpretation lies in the integration of robotic process automation with artificial intelligence, which needs to mature before it can be adapted to the process. This is likely going to take more than a decade for organizations to implement.

Finally, in terms of implications for practitioners and academia, this study could be used to shape discussions about the development of business processes and future directions of phenomenographic research, as well as to help frame concepts that aid in an interventionist approach.

7. Conclusion

This study examines the impact of robotic process automation on the accounting information systems of French organizations. This enables one to infer that with robotic process automation, the embedded technology with accounting information systems` environments turns more secure, accurate, and agile. However, from our analysis, we can see that there are some mixed feelings.

Indeed, while RPA does seem to have a positive impact on security, it seems that the accuracy and agility improvements come at a cost. The increased accuracy that comes with automating processes comes with the condition that a lot of well-done pre-work has been done to ensure that the processes are well programmed and therefore avoid any mistakes. The enhanced agility that it grants comes at the cost of regular updates and adjustments to the RPA to sustain this agility. Therefore, we conclude that RPA does make the accounting information systems more secure, accurate, and agile, but these require a well-structured automation project as well as the ability to sustain it.

RPA is particularly useful for automating simple, redundant, and generally low-added-value processes, but it could be expanded by embracing additional tasks. Indeed, by mixing RPA with artificial intelligence and machine learning, which is when software can learn from exceptions it was not programmed to handle, the new

process automation that would come out of this could be able to automate more complex processes that are less rule-based than the current ones, as the bots would be able to learn while doing the tasks, making them able to do more over time.

While this research achieved what it set out to do, identifying the impact of robotic process automation used in accounting information systems, it still has its limitations. All the cases are from professionals working in France for relatively large companies. France is a well-developed country and quite accepting of new technologies, which could be different in other territories. This study could be furthered by interviewing professionals from smaller companies as well as from different geographic areas.

Finally, explaining the impact of robotic process automation on accounting information systems to practitioners and academics can potentially reduce misconceptions about the subject. De facto, they are complementing the existing research strategies and literature.

References

Agostinelli S., Marrella A., Mecella M. (2019) Research Challenges for Intelligent Robotic Process Automation. In: Di Francescomarino C., Dijkman R., Zdun U. (eds) Business Process Management Workshops. BPM 2019. Lecture Notes in Business Information Processing, vol 362. Springer, Cham. https://doi.org/10.1007/978-3-030-37453-2_2

Alberth, M., and Mattern, M., (2017). Understanding robotic process automation (RPA). Journal of Financial Transformation 46: 54-61.

Anagnoste, S., (2017). Robotic Automation Process – The next major evolution in terms of back office operations. DOI: 101515/picbe-2017-0072

Ansari, W. A., Diya, P., Patil, S. & Patil, S., (2019). A Review on Robotic Process Automation - The Future of Business Organizations. 2nd International Conference on Advances in Science & Technology (ICAST) 2019 on 8th, 9th April 2019 by K J Somaiya Institute of Engineering & Information Technology, Mumbai, India, Available at http://dx.doi.org/10.2139/ssrn.3372171

Asatiani A., Penttinen E., Ruissalo J., Salovaara A. (2020) Knowledge Workers' Reactions to a Planned Introduction of Robotic Process Automation—Empirical Evidence from an Accounting Firm. In: Hirschheim R., Heinzl A., Dibbern J. (eds) Information Systems Outsourcing. Progress in IS. Springer, Cham. https://doi.org/10.1007/978-3-030-45819-5_17

Baharudin, B; Lee, L. H. & Khan, K. (2010) A review of machine learning algorithms for text--documents classification. Journal of advances in information technology 1(1), 2-20.

Cambridge Dictionary, https://dictionary.cambridge.org/

Cheon, J.M, Groven, V., Sabherwal, R., (1993). The evolution of empirical research in IS: A study in IS maturity, Information & Management, Volume 24, Issue 3, Pages 107-119, ISSN 0378-7206, https://doi.org/10.1016/0378-7206(93)90060-7.

Cigen (2017), "The Role of Robotic Process Automation (RPA) in Accounts Payable Process Management" [online] Available at: https://www.cigen.com.au/cigenblog/role-robotic-process--automation-accounts-payable-process-management

Cigen (2017), "The Role of Robotic Process Automation (RPA) in Accounts Payable Process Management" [online] Available at: https://www.cigen.com.au/cigenblog/role-robotic-process--automation-accounts-payable-process-management

Cooper, L. A., Holderness, D. K., Sorensen, T. L., Wood D. A. (2019), Robotic Process Automation in Public Accounting, Accounting Horizons, Volume 33, no. 4, DOI: 10.2308/acch-52466

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. BMC medical research methodology, 11(1), 1-9.

Egiyi, M. & Chukwuani, V., (2021). Robotic Process Automation (RPA): Its Application and the Place for Accountants in the 21st Century.

Fernandez, D., and Aini, A., (2018). Impacts of robotic process automation on global accounting services. Asian Journal of Accounting and Governance 9: 123-132.

Finance Strategist, https://learn.financestrategists.com/finance-terms/accounting-system--definition/

Galliers, R. D. (1993). Research issues in information systems. Journal of information technology, 8(2), 92-98.

Gartner Glossary, Available https://www.gartner.com/en/information-technology/glossary/robotic-process-automation-rpa 24/08/2021

Gotthardt, M., Koivulaakso, D., Paksoy, O., Saramo, C., Martikainen, M. & Lehner, O. (2020), Current State and Challenges in the Implementation of Smart Robotic Process Automation in Accounting and Auditing, ACRN Journal of Finance and Risk Perspectives, vol. 9, no. 1, pp. 90-102. https://doi.org/10.35944/jofrp.2020.9.1.

Hannabuss, S. (1996), Research interviews, New Library World, Vol. 97 Iss 5 pp. 22 - 30

Herm L. V., Janiesch C., Reijers H. A., Seubert F. (2021) From Symbolic RPA to Intelligent RPA: Challenges for Developing and Operating Intelligent Software Robots. In: Polyvyanyy A., Wynn M.T., Van Looy A., Reichert M. (eds) Business Process Management. BPM 2021. Lecture Notes in Computer Science, vol 12875. Springer, Cham. https://doi.org/10.1007/978-3-030-85469-0_19

Imoniana, Joshua O., Janette Brunstein, and Nova, Silvia Casa (2022). The account of teaching qualitative research method in accounting program in Brazil. Educational Research and Reviews 17: 264–72. http://dx.doi.org/10.2139/ssrn.4022461

Jędrzejka, Dariusz, (2019). Robotic process automation and its impact on accounting. Zeszyty Teoretyczne Rachunkowości 161.105: 137-166.

Kaya, C. T., Turkyilmaz, M., Birol, B. (2019), Impact of RPA Technologies on Accounting Systems, The Journal of Accounting & Finance, DOI: 10.25095/mufad.536083

King, N. (2004). Using templates in the thematic analyses of text. In Essential guide to qualitative methods in organizational research. Cassell, C.; Symon, G. (Ed.). Sage: London,

UK, 2004, 256-270.

Kokina, J., Blanchette, S. (2019), Early Evidence of Digital Labor in Accounting: Innovation with Robotic Process Automation, International Journal of Accounting, Volume 35, DOI: 10.1016/j.accinf.2019.100431

Kosi, F., (2019). Robotic process automation (rpa) and security. Master's thesis, Mercy College.

Lacurezeanu, R., Tiron-Tudor, A., Bresfelean, V. P. (2020), Robotic Process Automation in Audit and Accounting, Audit Financiar, vol. XVIII, no. 4(160)/2020, pp. 752-770, DOI: 10.20869/AUDITF/2020/160/024

Merriam, S. B. (1998), Qualitative Research and Case Study Applications in Education. Revised and expanded from "Case Study Research in Education"

Mingers, J. (2003). The paucity of multimethod research: a review of the information systems literature. Information systems journal, 13(3), 233-249.

Moffitt, K. C., Rozario, A. M., Vasarhelyi, M. A., (2018). Robotic Process Automation for Auditing. Journal of Emerging Technologies in Accounting; 15 (1): 1–10. doi: https://doi.org/10.2308/jeta-10589

Patton, M. Q. (1990), Qualitative Evaluation and Research Methods, 2nd ed., Sage

Santos, F., Pereira, R. and Vasconcelos, J.B. (2020), Toward robotic process automation implementation: an end-to-end perspective, Business Process Management Journal, Vol. 26 No. 2, pp. 405-420. https://doi.org/10.1108/BPMJ-12-2018-0380

Stake, R. E. (1995), The art of case study, Sage

Strauss, A. S.; Corbin, J. Basics of qualitative research: grounded theory procedures and techniques. Newbury Park: SAGE, 1990.

Syed, R., Suriadi, S., Adams, M., Bandara, W., Leemans, S. J. J., Ouyang, C., Hofstede A. H. M., Van de Weerd, I., Wynn, M. T., Reijers, H. A., (2020). Robotic Process Automation: Contemporary themes and challenges, Computers in Industry, Volume 115, 103162, ISSN 0166-3615, https://doi.org/10.1016/j.compind.2019.103162

Vasarhelyi, M. A., Rozario, A. M., (2018), "How Robotic Process Automation Is Transforming Accounting and Auditing ", The CPA Journal [online] Available at: https://www.cpajournal.com/2018/07/02/how-robotic-process-automation-is-transforming-accounting-and-auditing/

Willcocks, L.P., Lacity, M. and Craig, A., (2015). The IT function and robotic process automation.

Yin, R. K. (1994). Case study research: Design and methods, Sage.

Yin, R. K. (2009). Case study research: Design and methods (Vol. 5). sage.

Yin, R. K. (2009). How to do better case studies. The SAGE handbook of applied social research methods, 2(254-282).

Recebido em: 4-10-2023
Aprovado em: 18-12-2023
Avaliado pelo sistema double blind review.
Disponível em http://mjs.metodista.br/index.php/roc