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DIGITALIZATION IN ACCOUNTING
IMPACTS OF ROBOTIC PROCESS AUTOMATION IN ACCOUNTING WITH A
PARTICULAR OUTLOOK ON THE ACCOUNTANT'S ROLE

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Thesis presented to the Escola de Administração de
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Vargas, for granting the title of Master in Business
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Research Field: Finance

Advisor: Prof. Arthur Ridolfo Neto, Doctor.

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ABSTRACT

Purpose: New digital technologies in organizations became mandatory. Many publications in renowned scientific journals and consulting firms' research highlight the prominence of Robotic Process Automation (RPA) and its impact in the Finance and Accounting area. Apart from many optimistic and pessimistic outlooks on the effects of RPA in Accounting, this research aims to collect from the perspective of various professionals and specialists working with this tool in the Accounting area: the impacts of RPA in Accounting with a particular outlook on the Accountant's role.

Design/Methodology/approach: It is an exploratory study with a qualitative approach for data collection, based on semi-structured interviews, using the socio-technical lens. The outcome is a report looking for patterns, challenges, ideas, hypotheses on the Accounting professionals' role changes by RPA, captured from experts' perspectives working directly with this tool.

Value: The results offer valuable information for organizations and executives to review Accountant professionals' profiles and skills. It can also evaluate their career development plans and reevaluate their job descriptions. Additionally, it can provide insights for Accounting universities departments to review their graduation curriculum matching the market needs with suitable skill sets. As the last contribution, this paper would like to contribute by bringing insights to companies on how to proceed and succeed with RPA implementation.

Findings: As a conclusion of this thesis, RPA did not change the role of the Accountants; however, it has impacted the Accounting team skills requirements by migrating the Accounting team into a more hybrid profile, and it has evidenced that many Accountants were doing non-Accounting jobs, spending their time on non-value-added tasks instead of using their skills analyzing data and helping businesses to achieve their goals. RPA is also accentuating the need for digital skillsets for Accountant professionals. Besides soft and hard skills, digital skills such as technology fluency became compulsory.

Keywords: Automation, Robotic Process Automation (RPA), Digitalization in Finance and Accounting, Accountant's role.

RESUMO

Propósito: Novas tecnologias digitais nas organizações tornaram-se obrigatórias. Muitas publicações em renomadas revistas científicas e pesquisas de consultoria destacam o potencial da Robotização e Automação de Processo (RAP) e seu impacto na Área de Finanças e Contabilidade. Entre muitas perspectivas otimistas e pessimistas sobre os efeitos do RPA na Contabilidade, esta pesquisa quer coletar na perspectiva de diversos profissionais e especialistas que trabalham com essa ferramenta na área contábil: os impactos do RPA na Área Contábil com uma visão particular sobre o novo papel do contador e quais são as habilidades exigidas nas grandes corporações.

Metodologia/abordagem: Foi um estudo exploratório com abordagem qualitativa para coleta de dados, com base em entrevistas semiestruturadas, utilizando a lente sociotécnica. O resultado é um relatório em busca de padrões, desafios, ideias, hipóteses sobre as mudanças do papel dos profissionais contábeis pelo RPA captados a partir das perspectivas dos especialistas que trabalham diretamente com esta ferramenta.

Valor: Os resultados oferecem informações valiosas para organizações e executivos revisarem o perfil dos profissionais e de seus cargos de trabalho. Também fornece insights para que as universidades de ciências contábeis revisem seus currículos para com um conjunto de habilidades mais adequados para o mercado. Como última contribuição, este artigo pode oferecer insights para empresas que desejam implementar RPA sobre como proceder para ter sucesso.

Resultados: Como conclusão dessa tese, o RPA não mudou o papel dos contadores; no entanto, impactou a visão das habilidades requeridas para a equipe contábil, migrando a equipe contábil para uma composição mais híbrida, e evidenciando que muitos contadores estavam fazendo trabalhos não contábeis, gastando seu tempo em tarefas sem valor agregado em vez de usar suas habilidades analisando dados e ajudando as empresas a alcançar seus objetivos. A RPA também está acentuando a necessidade de novas habilidades para os profissionais de contabilidade. Além de soft e hardskills, habilidades digitais como fluência tecnológica, tornaram-se cada vez mais obrigatórias.

Palavras-chave: Automação, Robotização e Automação de Processos, Digitalização em Finanças e Contabilidade, Papel do Contador.

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1 INTRODUCTION

The introduction of new digital technologies in the organization creates a compulsory demand for new investments to meet cost-effectiveness, productivity gain, or maintain a competitive advantage to survive. The highly competitive market establishes the necessity to increase work agility and enhance the customer experience in all industries (Grandview, 2021). In the last decades, Finance and Accounting teams in large corporations have been adopters of those technological tools to optimize the business processes to provide correct and transparent information for all stakeholders. Agnosta (2017) mentioned that the next major revolution in back-office operations is the robotic revolution, and departments such as Finance, Supply Chain, and Human Resources will be fully impacted.

Business automation was the previous digital transformation, in which the corporations were investing a high amount of money in technologies to integrate their business process. Examples of software focused on process integration are Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP), such as SAP and Oracle (Dalebout, 2018). Robotic Process Automation (RPA) is considered one of the most recent technologies in this digital revolution. The RPA industry has been considered the “fastest-growing segment” of the global enterprise software market (Kirkwood, 2020), offering a fast Return on Investment (ROI).

RPA is a more straightforward but more advanced form of automation, in which an intelligent software or “bot” mimics human actions within existing applications (Kokina & Blanchete, 2019). This bot performs repetitive rules-based tasks, diminishing manual intervention, and executing low-value human tasks in an auditable and controlled manner (Wright et al., 2018). However, intelligence is programmed, not learned (Hill et al., 2019). Therefore, RPA is not intelligent in making decisions, but it is a low-cost implementation and maintenance with an average of eight weeks and costs ranging from EUR 6,000 to EUR 10,000 per bot a year (Dalebout, 2018).

The Global robotic process automation revenue is projected to reach 1,89 billion dollars in 2021, and the RPA market is forecast to grow at double-digit rates through 2024 despite COVID-19. Furthermore, it is estimated that large organizations will triple the capacity of their existing RPA portfolios. (Stamford, 2020). The pandemic has disrupted and accelerated the

need for a digital workforce across all industries such as banking, financial services and insurance (BFSI), retail, manufacturing, and IT & Telecom. (Grandview Research, 2021).

On the one hand, the need to automate repetitive tasks across business domains, such as tech support, technology, Finance, HR, operation, and procurement, contributes to market growth. However, on the other hand, it is expected to reduce labor cost overhead for repetitive tasks in many jobs. (Grandview Research, 2021).

Given the characteristics of the RPA phenomenon and, instigated by the gaps of the previous researches and the limited studies about the RPA implementation implication for Accounting and Finance professionals and tasks (Kokina & Blanchette, 2019; Le Claire, 2017; Kruskoopf et al., 2019), this study will explore the impacts of RPA implementation in the Accounting area with a particular outlook on the roles of the Accountants.

This research aims to understand the changes perceived on the Accountant's role with the RPA tools emergence and describe how companies and teams went through this implementation process since its adoption: the motivations, the skills required for the team succeed this digitalization tool and, the lessons learned during the journey. Thus, the central question of this research was: How does RPA implementation impact Accounting the most, and in which form has it changed the Accountant's role?

This thesis is structured as follows: (i) introduction; (ii) a session to discuss the literature on the concept of digitalization and RPA; (iii) the applications in the Finance and Accounting area; (iv) followed by a session explaining the research and data collection methods, and finally, (v) the last session presents the data analysis and conclusion.

2 LITERATURE REVIEW

The interest in the RPA topic has been growing, and the number of papers published exploring this subject also increased. On the other hand, since this is a relatively new and still not mature digital solution, ongoing studies are required.

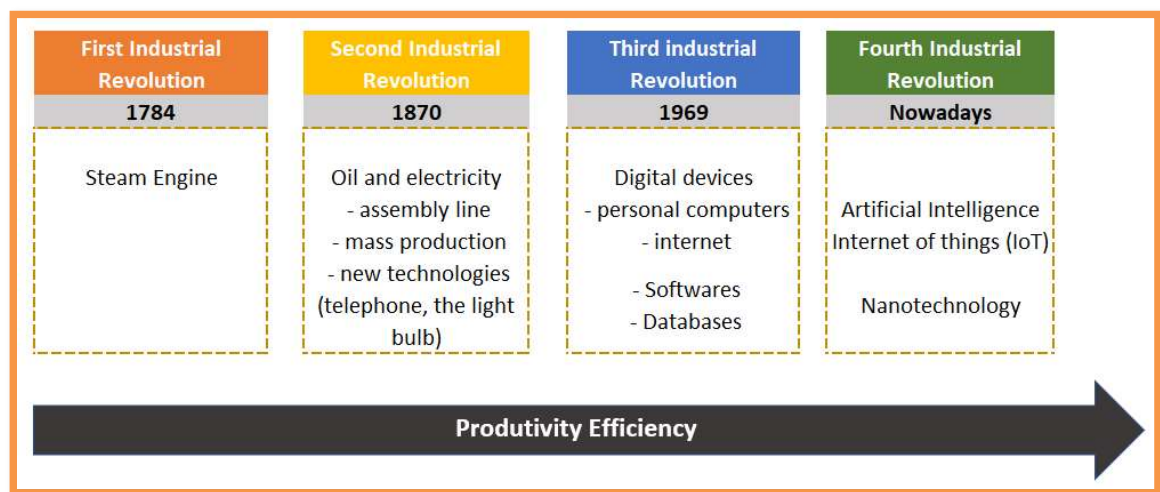
This literature review will explore the context of the emergence of RPA solutions in the back office area, followed by its application in Accounting and the impacts perceived on the Accountant's role.

2.1 Digitalization Revolution

Several names are given to the period that we are facing now, such as the 4th industrial revolution (Hoffman, 2017), Industry 4.0 (Ghani & Muhammad, 2019), the digital revolution, and the artificial intelligence revolution (Kruskopf et al., 2019).

The figure as follow represents the timeline of the Industrial Revolution and its respective disruption:

Figure 1: Industrial revolution



source: modified Hoffman, 2017, elaborated by the author

When we analyze the progress of the Industrial Revolution through the decades (**figure 1**), three common items can be highlighted among them:

- Allowed productivity gains;
- Required adaptation between humans and machines;
- New ways of running and doing business.

The fourth Industrial Revolution is a continuation of the third one. The core principle of it is computer software will be embedded in companies, assets, and people. They will change how data and information are used and allow companies to be more productive. (Kruskopf et al., 2019).

Technologies driving this digital transformation include Artificial Intelligence (AI), machine learning, a subset of AI, Internet of Things (IoT), 5G network, hybrid cloud computing, big data analytics, blockchain, and digital twin. (Amaba et al., 2020).

In the digitalization transformation, AI adoption is advancing significantly and faster than predicted in the past (Hill et al., 2019) among institutions, companies, and people. In a recent enterprise AI adoption study released by KPMG, in less than a few years, AI will have moved from “Technology to watch” to a “technology to deploy” (Hill et al., 2019). As a consequence of this advance, many tasks have been automated. This process can be done either by using robotic solutions, more associated with AI and Machine Learning (ML), or more straightforward form, that is, the application of RPA. Moreover, the fourth revolution raised the need to adapt humans and machines, enabling businesses to operate differently.

After this brief overview of the current industrial revolution, let’s dig down further to understand why companies are adopting RPA.

2.2 What is the definition of RPA?

RPA can be defined as a software-based or a “bot” solution in which robot scripts mimic human actions within existing applications (Kokina & Blanchete, 2019). It is used for processing transactions, manipulating data, and communicating with other digital systems (Hill et al., 2019).

The Technology behind RPA is a combination of autonomic systems, machine learning, AI, and Robotics. For the Business process, RPA most commonly refers to configuring the software to do the work previously performed by people, eliminating non-value-added elements (Kaya et al., 2018).

RPA solution typically performs repetitive rules-based tasks, reduces manual intervention, and executes low-value human activities in an auditable and controlled manner. For example: opening e-mail and attachments, examining incoming invoices, logging into the web, or any other application, making a calculation, and copying and pasting (Wright et al., 2018). Intelligence is programmed, not learned (Hill et al., 2019). It is a new and more advanced form of Automation (Hoffman, 2017), providing short-term results with low-cost implementation and benefits. Overall, the literature converges on the benefits of RPA. Tornone et al. (2016) described it as a well-structured solution with the following benefits:

Economic Value: RPA can increase productivity, lower operational costs, and reach return on investments (ROI) goals faster than traditional enterprise resource planning (ERP) deployment. There are two significant reasons for this: i) it can be deployed more quickly with a comfortable configuration for non-IT users and more precisely since it automates an “outside-in approach,” that is, the user interface level and, ii) it does not require complex Technology and high-level knowledge in programming. Also, there is no need for IT resource investment, reducing significant development time.

Workforce Advantages: RPA migrates part of the labor operating model to a digital workforce that can work 24 x7, and there are no labor costs, labor supply, or local labor legislation to follow. (Tornone et al. 2016) This technology operating model can scale in response and productivity. On the other hand, labor can shift attention to more judgmental and strategic activities. (Dalebout, 2018).

Quality and control improvements: The nature of human work includes an error, and robots are trustworthy, consistent, and tireless. (Kaya et al., 2019). On the other hand, although robotic tools are more sophisticated, they require extra control to trial every step in the process, and every activity is performed per each bot. The tool enables productivity and can be monitored, but it can also exponentially increase the errors if something goes wrong in the planning.

Flexible execution and scalability: RPAs projects are flexible, and they can be deployed and trained within a few weeks, and no extensive programming experience is required. It allows companies to achieve a high ROI quickly. Additionally, an RPA allows scalability since a bot can be rapidly reassigned since it can perform many types of processes.

The study presented by Kokina and Blanchette (2019) identified that RPA implementation required much greater IT involvement than the organization initially anticipated. On the other hand, Bygstad (2016) states that RPA is getting less dependent on IT, in which users or vendors do the deployment of a solution, and this independence is also known as “lightweight IT.”

Organizations can adopt RPA by choosing two approaches (UiPath, 2020): The company-driven and employee-driven approaches. The main difference between them is: a specialized team will centralize all the automation processes in the first one. In the second one, each employee who knows its tasks best is empowered to develop automation. Furthermore, there are two types of robots: attended robots that work under the human user’s supervision and

unattended robots that operate independently, requiring human intervention only when an exception occurs.

Table 1 - Characteristics of attended and unattended robots

Attended robots	Unattended robots
Easy user interface	Easy and effective distribution of work
It should react to what human user does each time	Deployment in virtual machines
It shouldn't need too much attention outside the work activities	Engagement with human users

Source: Elaborated by the author

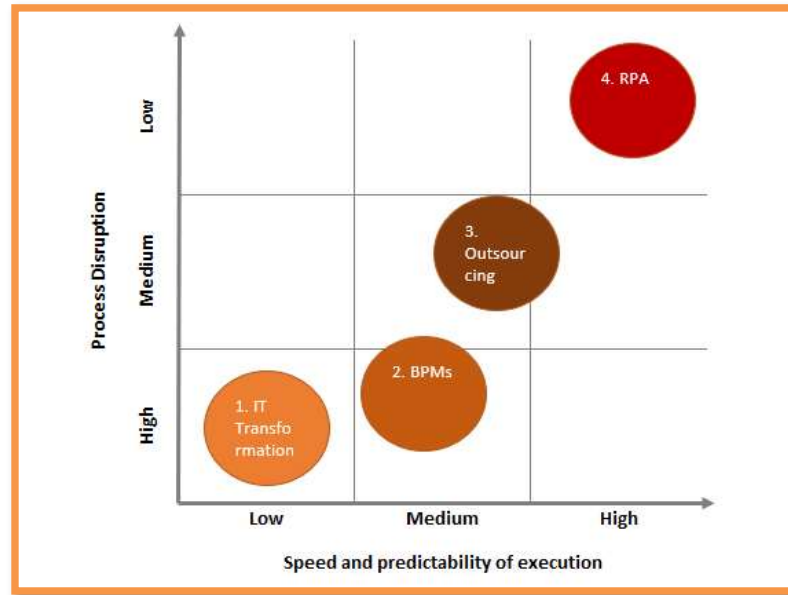
2.3 Why RPA solution?

To understand why companies ran into the RPA solution, we must go back in time a few years. As described by Lowes, P. et al., 2017, there are four significant organization's responses to achieve operating efficiencies:

- **i) Investments in newer or better-integrated enterprise applications**, such as Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM). Although those traditional solutions are more robust, in general, they are costly, require time for implementation and specialized IT knowledge, and have limited agility.
- **ii) Business Process Management – (BPM)** - software applications that often facilitate integration between enterprise applications to support the process, such as employee onboarding or payment approval of an invoice. The scope is smaller than ERP and usually less costly and less risky.
- **iii) Business Process Outsourcing provider (BPO)** - outside professionals are subcontracted to execute core business operations such as Accounting, payment processing, and tech support. Cost and performance can be improved only by doing things differently.
- **iv) RPA** – RPA is the subject of this research, and it proposes to minimize the operational deficiencies led by the previous responses.

Figure 2 (Lowes et al., 2017) summarizes those four organization responses regarding disruption and speed of implementation. It is noticeable that RPA came up as a low disruption but with quick execution and performance, which requires low investments.

Figure 2: RPA compared with other process transformation approaches



Source: Deloitte report, Lowes et al., 2017 – adapted by the author

2.4 Application of RPA in Finance and Accounting

Since RPA is mainly a solution to tackle repetitive, rule-based tasks, this tool is considered the next major revolution to back-office departments, including Finance, supply chain, and human resource departments (Anagnoste, 2017). All those areas face a challenge: relying on people to perform a high data entry volume, numerous manual processes subject to high error rates and rework, multiple non-integrated legacy systems, and high turnover due to low value-added activities (Dalebout, 2018).

Finance and Accounting functions have been affected since they are constantly under pressure to keep up with improvements. Shimamoto (2019) also emphasizes that RPA will allow Accountants to eliminate tedious and repetitive work and focus on higher-value tasks such as driving analytical insights. In addition, it's believed that the RPA application in Finance will increase the credibility and relevance of reporting (Ghani & Muhammad, 2019). This tool has already impacted roles in accounts receivable, accounts payable, planning and

budgeting activities, reconciliations, automatic booking, and financial operations such as consolidation and reporting (Kaya et al., 2019). However, only professionals prepared for this technology transition will succeed since digitalization in Finance provides many opportunities. As a complement, Kokina and Blanchette (2019) also found in their research that “Accounting’s roles in the organization are changing and so are the skills required.”

Gotthardt et al. (2019), in their study about the current state and challenges in the implementation of RPA and AI in Accounting and auditing, identified that to exploit the full power of RPA and AI systems, companies must have clear strategies and plans to mitigate the business and automation risks. **Table 2** below summarizes his findings and demonstrates the amplitude that RPA can impact an organization when implemented.

Table 2 -Identified targeted risk categories for implementing a program with RPA and AI

	<i>BUSINESS RISK</i>	<i>AUTOMATION RISK</i>	
CHANGE MANAGEMENT	How is HR tackling the impacts of RPA? How are changes to be communicated?	Identify and access management Secured business processes	CENTER OF EXCELLENCE
EXECUTIVE	Who has ownership of RPA initiatives? Who will manage the framework and promote efficiencies?	license compliance/Automation strategy and Governance	PROOF OF CONCEPT
FUNCTIONAL	Who designs control systems? Are there scalability limitations in RPA and core systems?	Adaptation schemes of existing systems with new features Legacy systems for simultaneous and unified operations across technical testing and rollout	BACKWARD COMPATIBILITY
TECHNICAL	How will the data quality and accuracy be ensured? How are the tests, validations, maintenance?	Incident management and business continuity Regulatory compliance	IMPLEMENTATION
OPERATIONAL	What controls exist to monitor performance? How will the business comply with regulatory requirements?	Data leakage and Cyber privacy threats	BUSINESS CASE

Source: Gotthardt et al., (2019), adapted by the author

2.5 Impacts or RPA on employment

There are no doubts about the benefits of RPA; nevertheless, there are many unanswered questions about the future of employment and whether bots will replace human jobs. As stated

by Petropolous (2017), this concern is not new. In the 1930s, John Keynes postulated his “Technological unemployment” theory in which technology can affect employment in two opposing ways: negatively, by displacing workers from tasks they were previously performing, and positively, by increasing the demand for jobs arisen due to automation. In his article, Petropolous (2017) provided several examples that technology leads to new employment opportunities. We need to keep tracking of RPA to see if it would impact following a similar pattern.

On the other hand, there is a lot of speculation about the effects on the human factor. As reported in Hoffman’s (2017) study, Oxford University researchers have estimated that 47 percent of U.S. jobs could be displaced by automation within the next two decades. In the article, Accountants were in the top 5 list of jobs to be automated. Ghani and Muhammad. (2019) also stated that Industry 4.0 would lead to a considerable reduction in human-intensive labor, which may, in turn, cause high unemployment rates”. According to Daugherty and Wilson (2018), there is a misconception to think that machines will gradually replace humans in labor markets. Digital technology will allow employees to expand on human values, and machines cannot offer that.

Kruskopf et al. (2019) emphasize that RPA is automatizing tasks, not jobs. Instead, it is more reasonable to think that a higher collaboration between humans and machines will be required. Although some jobs will probably disappear, many other new functions will be created since the technology's main power is achieved when combined with human capabilities. The table as follows, presented in Kruskopf et al. (2019) research, explain where humans and machines can be connected for more productivity. As stated by Hoffzman (2017), “New tasks for knowledge workers such as professional Accountants will arise, many of which can only be performed by humans—making humans with the right skills even more valuable.”

Table 3 - Human-machine teamwork

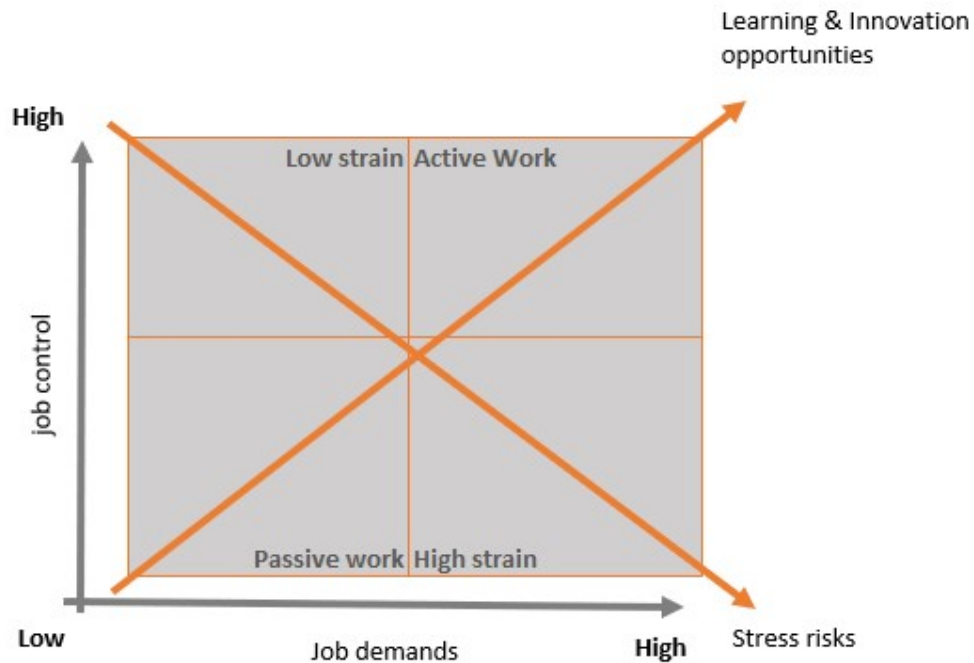
Lead	Understand behaviour and culture	Judge						Transact	Iterate	Predict	Adapt
Human-only activity			Train	explain	Sustain	Amplify	Interact	Embody			
			Humans Complete Machines	Machines Complete Humans							
			Human-machine hybrid activities					Machine-only activity			

Source: Kruskopf et al. (2019), adapted by the author

An important insight from the literature is that, although humans and machines need to collaborate, humans need to create and maintain the rules that drive the automated process that impact them. (Kruskopf et al., 2019).

From a socio-technical perspective, technological development implementations such as RPA should be carefully designed by organizations for their effects to be or to become positive (Govers, 2019). **Figure 3** presents the Job Demand-control model (1979-1990) used in Govers (2019). Bringing this framework to our study subject, to collect the positive effects of RPA implementation, organizations should combine high job demand and high job control. Job demands, such as work overload, time pressure, role ambiguity, are seen as stressors, and job control is the combination of autonomy, proper support, accurate information, and communication, leading to involvement and motivation. In this environment, employees are stimulated to learn and better respond to challenges.

Figure 3 - The job demand vs. job control model of Karasek (1979,1990)



Source: Govers, (2019), adapted by the author

2.6 Challenges to the Accountant's role

In a research published by ACCA, 2013, Accountant's and Finance's roles have expanded with the surge of new technologies. The article mentions a need to understand digital technologies to scale their potential impact on business, the profession, and their relationship. Additionally, it predicted that all Accountants need to be more proactive than reactive to digital technologies. Accountants should reshape their role and tackle critical issues such as analyze a vast amount of data. "... Accountants must maintain awareness of a broad range of technologies and trends and then use their analytical and problem-solving skills to assess the potential influence of these technologies, providing insights needed to guide and set vision and direction, as well as tactical and strategic business decisions" (ACCA,2013, pg 14).

Kokina et al. (2021) mapped five RPA roles as a career opportunity. RPA identifier, RPA explainer, RPA Trainer, RPA sustainer, and RPA analyzer. Each of the roles would require specific skill sets and a wider variety of career opportunities depending on the individual's competencies.

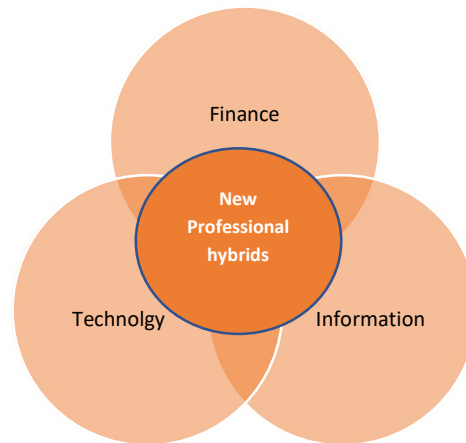
In partnership with ACCA, 2013, the Institute of Management Accountants published a report answering the question: “how will big data affect businesses over the next 5 to 10 years, and what opportunities and challenges will it create for the accountancy professional? Those professionals will need to acquire new technical skills set, and its role will be to help businesses to:

- Improve decision making
- Manage risks
- Identify and develop new markets
- Improve operational efficiency
- Increase margins

Silva (2019) published a study about the new skills and abilities required to Finance and Accountants professionals due to the emergence of new technologies. The results are not different from what ACCA predicted back in 2013. Silva (2019) indicates that technical skills will still be required; however, soft skills and working with new technologies became even more relevant. It is expected that the latest Finance and Accountant professional will play a more relevant role, helping businesses in the decision-making process. This professional should be connected to the market, competitors, internal and external environment, and alerting about risks.

ACCA report predicted in 2013 that in the next 5 to 10 years, the accountancy professions would be the intersection of Finance, technology, and information, as represented in **figure 4** as follow:

Figure 4 - New Accounting and Finance Professional Hybrids



Source: ACCA (2013), adapted by the author

Supporting this ACCA study, recent research on RPA lead by Kokina et al. (2021) states that “as automation becomes embedded into the culture of organizations [...] companies looking for Accountants with more STEM(Science, Technology, Engineering, and Math) skills.

2.7 Literature map

Scientific researchers and global professionals' entities have studied this digitalization phenomenon in the business transformation. The table below (**Table 4**) summarizes some relevant studies used in this research.

Table 4- Literature map review

Concept about what was written	Author	Objective	Conclusion
Artificial Intelligence implementation	Amaba et al., (2020)	The article discusses the key drivers, constraints and disciplines used for the implementation and impact of artificial intelligence (AI) technology when applied to solve precise and measurable problems.	The business leaders, engineers and data scientists with foresight to harness Industry 4.0 cyber-physical systems will reap market advantage with intelligent workflows that free up human resources to advance product innovations and align for profitable growth.
Robotic Process Automation	Anagnoste, (2017)	The study analyzes the most critical vendor providers of RPA solutions on the market and will provide specific case studies from different industries.	There are a lot of challenges and opportunities ahead: governance; process documentation and audit trails; Machine learning will come to RPA boots, new high-value added jobs
IT role in the digitalization	Bygstad, (2016).	This paper proposes a simple terminology for understanding and dealing with two current phenomena: Heavy-weight IT vs. Lightweight IT.	The findings show that (i) generativity enfold differently in heavyweight and lightweight IT and (ii) generativity in digital infrastructures is supported by the interaction of loosely coupled heavyweight and lightweight IT. The practical design implication is that heavyweight and lightweight IT should be only loosely integrated, both in terms of technology, standardization and organization.
Robotic Process Automation	Dalebout, (2018).	This study examines the effects of the implementation of RPA on the alterations of job characteristics of the jobs directly involved in the implementation of RPA. Furthermore, the gap between intended FTE reductions and the realized savings of FTEs is examined to gain insights into the changing job landscape surrounding RPA.	The findings indicate that the implementation of RPA contributes to the enrichment and enlargement of the involved jobs. There were no observations which indicated the existence of a gap in FTE effort. However, the discussed RPA projects have a low maturity and size. The managerial implications of the findings indicate the need for anticipation on the increase in required skills of the employees and the redistribution of tasks after an RPA implementation.
Robotic Process Automation	Gotthardt et al., (2019)	The study presents a summarized overview of the transforming RPA ecosystem. It indicates what challenges are critical to being confronted for a successful implementation of such systems in accounting and auditing.	To achieve a successful implementation of such systems in accounting and auditing, it must be kept in mind that cross-departmental support and a clear mindset must be retained, both clear strategies and problem statements have to be defined, and know-how has to be canalized into the right centers of excellence with suitable skills.

(To be continued)

(Continuation)

Concept about what was written	Author	Objective	Conclusion
Digital technology	Govers (2019)	This article applies Lowlands sociotechnical systems design (STS-D) theory to discover how this method, especially the design sequence, should be adjusted to use successful digital technology in organizations.	The conclusion is that the original design sequence requires adjustment from a digital technology perspective. The article proposes a combined approach from a digital-technical and social perspective. It ends with new routines for designing modern 21st century organizations that facilitate organizational and digital experts to jointly optimize both perspectives in practice.
Robotic Process Automation	Kaya et al., (2018)	This paper aims to analyze the implementation and improvement areas of RPA in Enterprise Resource Planning (ERP) and Materials Resource Planning (MRP) within the scope of financial reporting systems in the context of changing cost accounting systems.	The paper concludes that RPA and related other technologies will reduce the dependency on human work, reduce costs and increase efficiency in business operations. RPA will especially improve error-free and accurate transactions in accounting and increase the efficiency and effectiveness in monitoring and auditing transactions.
Digital labor in Accounting	Kokina & Blanchette (2019)	This paper explores emerging themes surrounding bot implementation for accounting and Finance tasks.	The paper reveals that securing technical capability is only a part of RPA implementation process. Organization engage in standardization and optimization of processes, develop scorecard-like tools to rank tasks, adjust governance structures to include digital employees, and redefine internal controls. Organizations benefit from automating only certain processes, those that are structures, repeated, rules-based, and with digital inputs. Along with cost savings, organizations experience improved process documentation, lower error rates, more accurate measurement of process performance, and better report quality.
Role of accountants	Kokina, et al. (2021)	This paper explores how RPA is changing Accountants' work, identifying the roles that Accountants will play in their organizations' digital transformations, and categorizing the skills and competencies that Accountants will need to develop.	The paper reveals that accountants play important roles as Identifiers, Explainers, Trainers, Sustainers, and Analyzers of their organizations' automation initiatives. To prepare to undertake these five roles, accountants will need to acquire new technical skills. Therefore, the paper concludes with a mapping of the skills needed for each role that the accountant is expected to play in RPA implementations.
Impact of Technology on the Accountant field	Kruskopf et al.,(2019)	This paper gives an overview of the current and future technologies impacting the accounting and auditing fields. The aim is to present the technological disruptions shaping these fields and also look at how they might influence future Jobs and required skills.	Time consuming and repetitive work will be automated, and the future Accountant and auditor will perform higher value work, while transforming into more advisor roles in Finance and business. Overall, we expect a promising and innovative future, where human-machine cooperation will be key and the individuals with the right skillsets will be set to prosper in this future.

Source: Elaborated by the author

3 METHODOLOGY

3.1 Research Strategy

Given the characteristic of the RPA phenomenon to be explored, this study adopts a qualitative approach. The qualitative methodology allows us to collect valuable, detailed, and contextualized information that participants hold on the topic, even with a relatively small group (Souza, 2009). This methodology is particularly indicated in exploratory work and discoveries.

Although RPA can be applied in the business of all sizes, traditionally, larger companies are the early adopters of the RPA technology due to the following reasons: i) mature core business; ii) intense competition and, iii) ability to invest (Tan, 2020). For that reason, this study targeted to find participants from large corporations that have declared using RPA in Accounting.

The initial idea of this research was to have participants from small professional services offices as well since they cover a significant percentage of Accountant's working class. Approximately 70,000 Accounting professional service firms are registered in the Conselho Federal de Contabilidade (Ribeiro, 2020). However, the small professional services were excluded from the research for not having experience with RPA to share.

As qualitative research involving participants, it was necessary to submit the project and the questionnaire to the FGV Ethics Committee, which approved the study in Dec 2020 as formalized by e-mail.

3.2 Research participants

The access and selection of the participants for this research were through the social platform LinkedIn and FGV networking. The selection criteria were to find professionals with expertise in RPA, experience, and knowledge on the subject. Marshall (1999) defines this process as an "elite interview," a particular case of in-depth interviews with individuals considered influential, prominent, and well-informed in an organization or community. We got a list of potential contacts from large companies that could participate in the research from that

networking. An e-mail or LinkedIn message was sent explaining the objective of the study, and if we got a positive response, an interview was scheduled to collect the data.

Our selection included 20 (twenty) professionals who brought stimulating inputs of their experience and perception about the impacts of RPA on the Accountants' role. There is not a consensus on the ideal number of interviews for qualitative research. However, the sample used in qualitative research can be smaller than quantitative research because it is centered on how and why a particular phenomenon occurred (Dworkin, 2012). Dworkin (2012) also emphasizes that many articles, book chapters, and books recommend guidance and suggest anywhere from 5 to 50 participants. We considered the number of 20 respondents acceptable in an in-depth interview to capture relevant data for this research.

Although the number of Accountants working for large corporations covers only a small portion of Brazil's Accountants number, this research focused on this public as small companies were not experienced enough to share their knowledge on the topic at the present date. However, the increasing number of RPA vendors are reducing the entry barrier, indicating that this scenario might change in few years (Tan, 2020). **Table 5** presents the profile of the research respondents, and their names and company name were hidden due to anonymity and confidentiality.

Table 5 - Research Participants

Respondents	Background	Years of experience	RPA Role	Sector	Annual Revenue
Respondent A	Engineer	15 to 20 years	Consultant	Accounting services	Over USD 1 billion
Respondent B	Accountant	+20 years	Consultant	Accounting services	Over USD 1 billion
Respondent C	Business Administrator	+20 years	Requester	Construction	Over USD 1 billion
Respondent D	Accountant	+20 years	Implementer	Technology	Over USD 1 billion
Respondent E	Accountant	+20 years	Consultant	Accounting Consultant	Over USD 1 billion
Respondent F	Information Technology	+20 years	Consultant	Accounting services	Over USD 1 billion
Respondent G	Accountant	+20 years	Requester	Food, Drink, Tabacco	Over USD 1 billion
Respondent H	Information Technology	15 to 20 years	Implementer	Technology	Over USD 1 billion
Respondent I	Accountant	+20 years	Implementer	Technology	Over USD 1 billion
Respondent J	Accountant	15 to 20 years	Implementer	Technology	Over USD 1 billion
Respondent K	Accountant	15 to 20 years	Requester	Food service	Above USD 100 MM to USD 500 MM
Respondent L	Business Administrator	+20 years	Requester	Utilities	Over USD 1 billion
Respondent M	Information Technology	+20 years	Implementer	Agriculture	Over USD 1 billion
Respondent N	Accountant	15 to 20 years	Requester	Electronic Industry	Over USD 1 billion
Respondent O	Accountant	15 to 20 years	Requester	Chemical	Over USD 1 billion
Respondent P	Accountant	+20 years	Requester	Chemical	Over USD 1 billion
Respondent Q	Economist	+20 years	Requester	Global Telecom	Over USD 1 billion
Respondent R	Accountant	+20 years	Requester	Healthcare	Below USD 100MM
Respondent S	Information Technology	+20 years	Consultant	Accounting services	Over USD 1 billion
Respondent T	Accountant	+20 years	Requester	Health Services	Over USD 1 billion

Source: elaborated by the author

The participants agreed with recording the interviews and were also previously informed that the citations would be anonymous, guaranteeing better autonomy in expressing ideas. All of them accepted and signed the term of the interview consent either by e-mail or by signing the form. Although **table 5** does not disclose the participant's name and the company's name, all the confidential details were compiled in an encoded excel file. Thus, it can be certified by the FGV Ethics Committee if required.

3.3 Data Collection and analysis

The primary data were collected through recorded and transcribed interviews. There are three types of research interviews: structured, semi-structured, and unstructured. Table 6 summarizes the characteristics of each interview type:

Table 6 - Research interviews characteristics

Research Interview	Characteristics	Advantages	Disadvantages
Structured	List of predetermined questions with little or no variation and with no scope for follow-up questions.	Quick and easy to administer	It does not provide depth data
Semi-structured	It consists of several keys but general questions that help to define the areas to be explored.	Provides some guidance for participants, and this approach is flexible since it allows the elaboration of information that is important to participants but may not have previously been thought of as pertinent by the researcher.	Time-consuming, labor-intensive (vast amounts of notes and pages of transcripts) require interviewer sophistication (to ask follow-up questions).
Unstructured	Are performed with little or no organization.	This type of interview is used when nothing is known about the subject area or a different perspective is required.	Very time-consuming, can be challenging to manage, and provides little guidance that can make participants confused.

Source: Adams (2015) and Gill et al. (2008), adapted by the author

This study applied the semi-structured questionnaire to maximize the exploration of RPA from comprehensive perspectives. Semi-structured interviews comprise broad and more general questions (Arksey and Knight, 1999), giving more freedom to the participants to share their thoughts and reflections. Moreover, the target was to have rich inputs to answer this research question and bring new insights for future investigations.

Due to the COVID 19 pandemic scenery, the interviews were performed 100% virtually by the tool Zoom or Microsoft Teams.

The questionnaire comprises 12 (twelve) questions to cover 5 (five) main objectives presented in **table 7** – General Questionnaire objectives. The primary source of the question was the study presented by Dallebout (2018), which studied the effects of RPA on FTE effort

and the design of jobs involved. Some of the questions were adapted, and other specific questions were added to reach the objective of this research.

Table 7 - Questionnaire vs. objectives

Objectives	Questions
Respondent's Profile	Questions 1 and 2
RPA Motivations	Question 2 and 3
Accountant's skills and Capabilities	Questions 4, 5 and 7
New Accountant's role	Questions 6 and 12
The key success factor for the RPA project	Questions 8, 9, 10 and 11

Source: elaborated by the author

The script used to conduct the interview is found in **Appendix A**. In addition, all the participants received the questions beforehand attached in the outlook appointment.

The data analysis and interpretation were organized by patterns and related to the objectives listed. The content analysis method was applied to the audio and transcription of the interviews, interpreting their experience narrative on the topic and their perceptions on the impacts of the RPA tool on the Accountant's role. Since some interviews were conducted in Portuguese, free translation and context were taken into consideration. For each objective, it was listed some keywords used by the participants to answer the question. With this systematic, we built a matrix to interpret the results, as shown in **table 8**.

Table 8 - Example of the interview data content analysis

Motivation	Interviewees																Mentioned				
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	# Interviewees
Productivity	1	1	1	1			1		1	1	1	1		1	1		1				12
Efficiency	1		1		1	1	1	1		1		1	1	1		1	1				12
Reduce employee workload			1	1	1			1			1			1	1	1		1	1	1	11
Reduce Errors		1		1		1		1	1							1	1	1			8
Scalability	1	1			1	1		1		1	1	1									7
Better data quality	1	1					1		1		1					1				1	7
Cost Reduction		1										1	1			1	1				5
Reallocate employees to more complex activities		1	1			1					1								1		5
Provide better service/product to customers			1			1			1							1					4
Standardize Processes			1			1										1				1	4
Competitiveness		1									1		1		1						4
Senior Lidearship goal					1		1		1												3
Meet closing deadline				1																	1
Quicker ROI						1															1

Source: elaborated by the author

Souza (2009) cited that when we are analyzing qualitative data, there is no formula. This process is a creative system that requires intellectual diligence.

4 RESULTS AND DISCUSSION

In this chapter, we will present and interpret the results of the data collected through the interviews. The results will be following the **table 7** order, starting with respondent's profile, followed by RPA motivation, Accountants' skills and capabilities, Accountants' new role, and key success factors for RPA implementation. The complete data tabulated by objectives can be found in **Appendix B**.

4.1 Respondent's Profile

Based on questions 1 and 2 of the questionnaire, we built the stratification of the respondent's profile for this master research. It was an open question to understand the interviewee's background and involvement with RPA in Accounting.

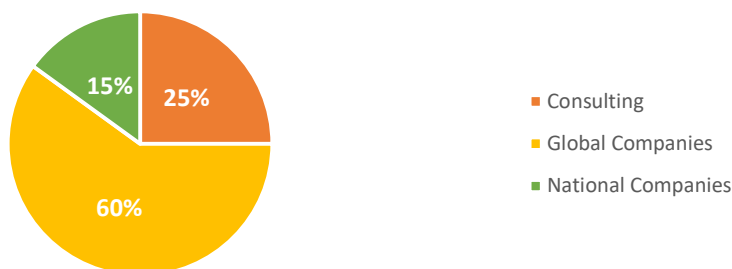
All of the 20 participants had extensive experience in the Finance and Accounting area. One curious fact was that most of them were interested in technology even before the emergence

of RPA. To understand the profile of the respondents, we summarize in figures the following items:

- a) Respondent's working company (**Figure 5**)
- b) Company's consolidated annual revenue (**Figure 6**)
- c) Respondent's education (**Figure 7**)
- d) Respondent's years of experience in Finance (**Figure 8**)
- e) Respondent's RPA role (**Figure 9**)

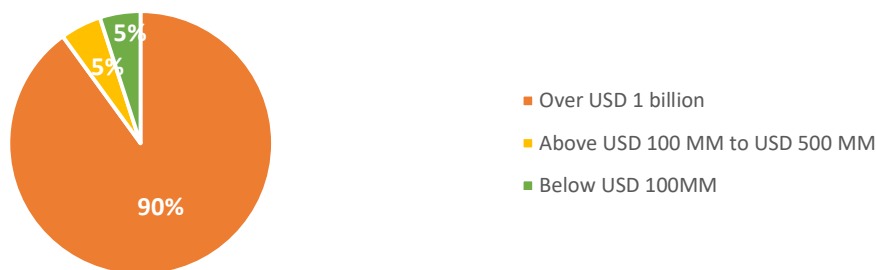
In **figures 5 and 6**, we can observe that data collected during the interviews represent experiences of RPA, mainly in large national and global companies.

Figure 5 - Respondent's working company



Source: Research's data – 20 respondents in total

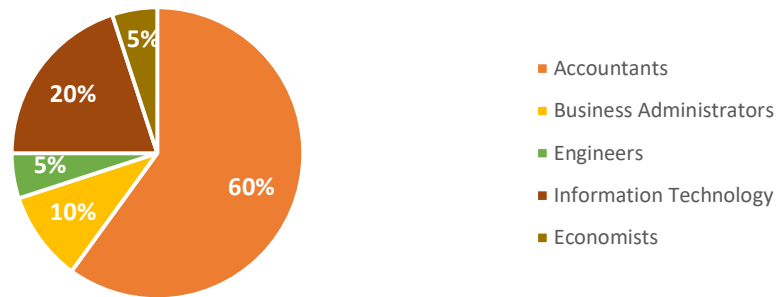
Figure 6 - Company's consolidated revenue



Source: Research's data – 20 respondents in total

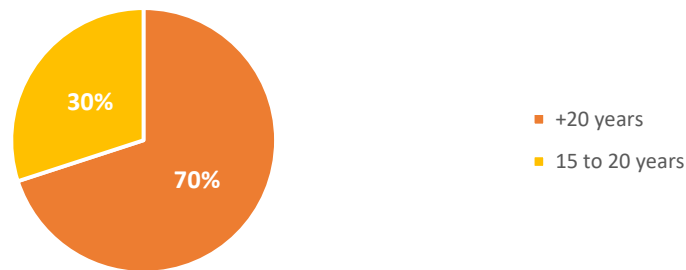
Figure 7 shows 60% of the participants working with RPA have an Accounting background and all of them had over 15 years of experience in Finance or Accounting, as represented in **figure 8**.

Figure 7 - Respondent's education



Source: Research's data – 20 respondents in total

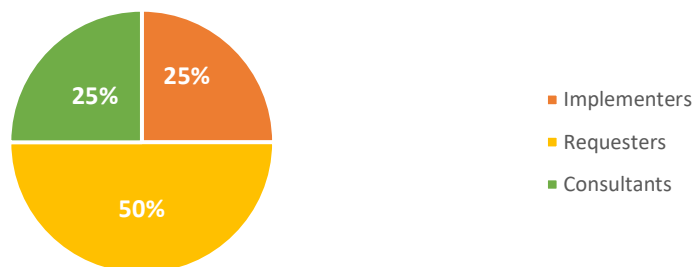
Figure 8 - Respondent's years of experience in Finance



Source: Research's data – 20 respondents in total

Figure 9 shows that 50% of the respondents work as a requester of RPA solutions in their area. The other 25% works as RPA solution consultants and the additional 25% as RPA implementers.

Figure 9 - Respondent's RPA role



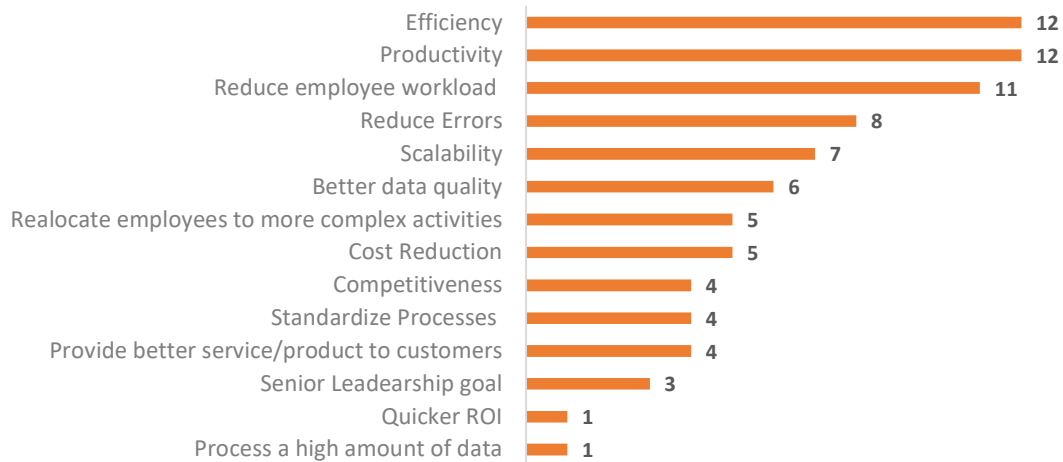
Source: Research's data – 20 respondents in total

As we could observe, the respondents of this research are highly qualified with vast experience in Finance and Accounting and knowledgeable about the RPA topic.

4.2 RPA Motivation

Questions 2 and 3 were used to understand the reasons behind RPA adoption in Accounting. The main keywords used by the participants to explain the motivation behind RPA adoptions are represented in **figure 10**.

Figure 10 - RPA motivation collected through the interviews



Source: Research's data – 20 respondents in total

Most of the reasoning for RPA adoption in Accounting obtained through the interviews is aligned with the literature review in section 2.3 – What is the definition of RPA?. Linking the benefits listed in the literature with the respondent's motivations in implementing RPA, it is possible to notice that the economic value is the main reason, followed by the workforce advantage and quality and control improvements. Flexible execution and scalability were mentioned only by 7 out of 20 participants.

Table 9 - Literature review RPA benefits vs. Research's data

Benefits	Respondent's keywords #	Mentioned keywords sum
Economic Value	Efficiency (12); productivity (12); cost reduction (5); quicker ROI (1)	30
Workforce Advantage	Reduce employee workload (11); relocate employees to more complex activities (5)	16
Quality and Control improvements	Reduce errors(8); better data quality (6)	14
Flexible execution and scalability	Scalability (7), process a high amount of data (1)	8
Others	Competitiveness (4); standardize processes (4); provide better product and service (4); senior leadership goal (3)	15

Source: Tornone et al. (2016) & Research Data

Some participant's highlighted quotes:

- **Economic Value**

Respondent E: *"RPA tools are more structured. This is a natural migration to gain productivity and efficiency."*

Respondent M: *"Cost reduction, productivity. Since our product is a commodity, I cannot interfere in the price, only on the costs"*.

- **Workforce advantage**

Respondent L:

"Moving the team from transactional to analytic."

- **Quality and Control improvement**

Respondent C: *"Working hard in the back office process and get ready for IPO for the next year."*

Respondent I: *"The Business understood that the data quality was not good. Our biggest motivation: improve the quality of information to business decision making."*

- **Flexible execution and scalability**

Respondent D: *"Necessity is the mother of invention...RPA was the solution to process 8.000 to 10.000 journal entries [...] Meeting closing deadline."*

Respondent K: *"Structure our back office to attend the business growth without increasing FTE. We want to become 100% digital Accounting team by 2022"*.

On the other hand, it was also possible to identify different motivational voices among the participants—for example, adoption to keep competitiveness and deliver better products or services.

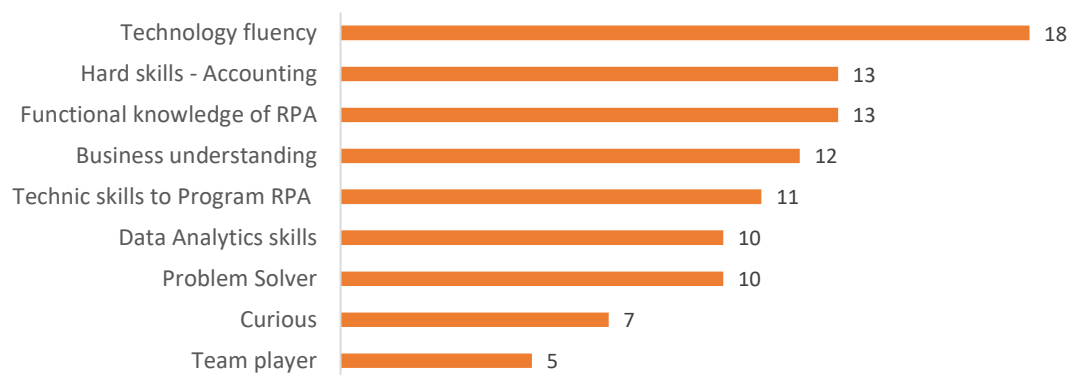
Respondent F: *“There were two RPA implementation waves. In 2016/2017, companies got desperate to implement RPA on a large scale because their competitors were implementing it. [...] the second wave came with the pandemic... no money to invest, but they need to deliver better service”.*

There is clear evidence that the motivations behind RPA adoption are associated to better serve the business with data analysis and information for decision-making to bring financial gains and competitiveness. In other words, RPA’s adoption is motivated by Accountants playing their role properly.

4.3 Accountants Skills and Capabilities

In order to bring a sequence of understanding RPA on the new Accountants’ role, the survey dedicated some questions to comprehend which skills were required for a successful RPA implementation. So questions 4, 5, and 7 were devoted to collect respondent’s arrangements to attract the best talents on their teams. **Figure 11** consolidates the keywords used by the interviewees to describe best the skills sets required for RPA implementation.

Figure 11 - Accountant’s skills



Source: Research’s data – 20 respondents in total

One of the topics mentioned by almost all the participants was that Accountants should have technology fluency, that is, the ability to navigate various devices, programs, and apps,

even those that haven't been used before, to achieve desired outcomes. (Briggs & Makice, 2011). Additionally, for a successful RPA implementation in Accounting, it is crucial to have a good knowledge of accounting policies as well as business and process understanding. Hard skills and soft skills were also mentioned, with different perspectives by the participants. Some main comments are presented as follow:

Respondent A: *"... we need a curious person, someone that knows where to apply technology and that likes technology."*

Respondent C: *"I need someone connected with technology and understands the end-to-end process." "Someone able to identify problems and opportunities."*

Respondent E *"Every company always has someone that likes technology. We need to capture this person to join RPA projects."*

Respondent G: *"Technical knowledge is essential. However, I am looking for someone intelligent, curious, a good communicator; emphatic focused on projects and innovation"*.

Respondent I: *"Before, we were looking for professionals experts in excel, and now, with automation, this is not mandatory anymore.... Now we require professionals with Finance experience and a good understanding of how the business operates, and not purely Accounting knowledge."*

The participants also shared the difficulties of preparing the team for the digital mindset. They faced a lot of resistance when implementing RPA, as exemplified as follow:

Respondent K: *"90% of the team did not have any digital ability. We had a lot of resistance with the justificative: I am an Accountant. This is not for Finance."*

Additionally, participants realized the need to leverage digital skills in the teams, and some actions were taken as exemplified as follow:

Respondent O: *"It is hard to find Accountants with an RPA background. So we are trying to develop those skills internally."*

Respondent S: *"We invested a lot in training, generating specialists per area."*

It was also possible to identify that the Accounting team configuration is not necessarily made by Accountants only. The RPA has open space to hybrid teams as exemplified as follow:

Respondent A: *"We all can have digital skills, regardless of graduation."*

Respondent D: *“Before we were hiring only Accountants, and we are gradually hiring people from a technology background, depending on the role. However, you need to have a mix”.*

Respondent E: *“I am trying to build a mixed team, so graduation does not matter much because we provide Accounting training.”*

Respondent F: *Technology is now mandatory in all areas. For example, I have four astronomers in my team due to their mathematical and statistic modeling knowledge. I also have a Physician in my team to develop a solution to a hospital.”*

Respondent N: *“Before, I need to hire Accountants, but now, it is better to hire someone from technology and teach them the basics of Accounting.”*

On the other hand, the RPA tool was adopted by many teams without IT dependence, aligned with Bygstad’s (2016) research about “lightweight TI,” that is, the independence of users and vendors to deploy a solution.

Respondent B: *“We taught RPA to our Accounting team without IT help.”*

Respondent H: *“I believe that an Accountant does not need to know to code because the RPA tool is drag and drop.”*

Three respondents also raised the concern that universities are not following this digital trend to form Accounting professionals with a digital mindset:

Respondent C: *“juniors are badly prepared from universities.”*

Respondent E: *“We need universities integrated to the market [...] Change the learning methodology. Super relevant to have more qualified people since the beginning”.*

Respondent P: *“I would still hire Accountants. However, I do not believe I will find a person with the characteristics I am willing to: with technology mindset[...] because I know that the universities are not following what is happening”.*

The results of this research also show that Accounting skills have been adapted to this digital movement. There is the confirmation that with the outcome of the RPA, many tasks were replaced by robots, and the main conclusion I get is that there were plenty of Accountants doing non-Accountant tasks. This is the root cause of the misconception that machines will replace humans (Daugherty & Wilson, 2018). As a natural consequence of RPA, new tasks and new job descriptions can soon emerge.

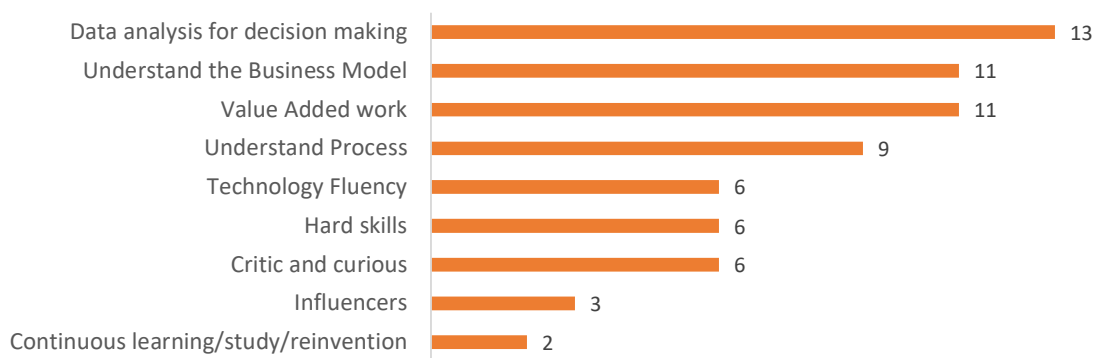
Over time, the Accountant's skills requirement has been changed. Not long ago, on the top of the list was checking employees' hard skills, that is, his ability to perform their technical Accounting job. Then, having only hard skills was not enough to play the role effectively. It was necessary to have soft skills to thrive in the workplace, demonstrating resilience, communication abilities, and the capacity to influence and adapt to a changing environment. We currently observe that there is a new element in the Accountant's skills set: Technology skills. Companies are valuing digital skills at the top of the list, or at least, their conception of a perfect Accountant would be the one with the combination of these three skill sets: hard skills + soft skills + digital skills. But, as expressed during our data collection, this profile is still hard to find. Participant B described these new skills requirements humorously. “ *We need IQ - Intelligence Quoefficient, EQ -Emotional Quoefficien and now DQ -Digital Quoefficient*”.

Furthermore, Accountants who can acquire the news skills to perform their role in this new digital world will be highly valued. It was noticeable that the way companies are compounding their Accounting team is also changing. Some have adopted hybrid teams, and others focused on training Accountants to have digital skills set. In recent research published by Kokina et al. (2021), the speech given was that companies are looking for Accountants with more STEM (Science, Technology, Engineering, and Math) skills as automation becomes embedded into the culture of organizations, confirming the trend of a mixture of competencies in the Accounting team. However, I still believe that the preference will be to build a team with Accountants, with technology skills training.

4.4 Accountants new role

The previous section focused on the necessary skills for the Accounting team to successfully implement RPA. As a sequence, questions 6 and 12 were open-ended questions to obtain the respondent's perspective on the impacts of RPA on the Accountant's role. As per the interviewee's perspectives, the RPA tool provides Accountants opportunities to perform a more relevant job, moving from operational to analytics. **Figure 12** shows the keywords used by the participants to describe the new Accountant's role in their perspective:

Figure 12 - Accountants new role



Source: Research's data – 20 respondents in total

The results of the new Accountant's role demonstrate that Accountants should offer value to the business by analyzing data since they know the language of business. Segregating the keywords used by the participants to describe the new role of Accountants, the first four items are co-related. Accountants should analyze data for decision-making and understand the business model and the processes to contribute to the business results. Some participants' point of view is presented as follow:

Respondent A: *"people need to be relevant. Robot will replace who would allow that".*

Respondent C: *"I do not need an Accounting only to sign the balance, but someone to add value and propose changes that add value to the business."*

Respondent E: *"Accountants will be relevant.... Before, they spent a lot of time doing calculations and less time analyzing. Nowadays, they do not need much time to calculate, so they are exposed to analysis.[...]Understanding the business model, understand the numbers and the competitors, Accountants can bring more insights to explain what's going on."*

Respondent N: *Accountant will be someone who will deliver value to the business to make decision making. What could they do to be more profitable? Accountants will be the business's partner, their consultant."*

Respondent P: *“I believe that the Accountants need to add value to the business. That brings relevant inputs with analytical skills. [...]the more technology you have applied to your processes, the better it will be for everyone.”*

The participants of this research describe a role of accountants that is not happening yet. Comparing the respondent’s answer with section 2.6 in the literature review, representing the expected Accountant and Finance roles (ACCA, 2013), the respondent’s answer is aligned with the study. There is still a giant gap between what Accountants are supposed to do and what they are currently doing.

Another group of respondents endorses that Accountant’s roles will not change with RPA, but they will reshape their roles to guide business tactically and strategically. Again, see the examples as follow:

Respondent D: *“Accountants role will not change, but it will adapt with the new technology. RPA will be a consequence.... [...] the newer tools will only be part of the job, as like when excel came or ERP”.*

Respondent H: *“Accountant role will not change. Automation will empower human capability to analyze data, which has continuously increased”.*

Respondent I: *“The future of Accountants will be reinvention. [...] Professionals need to reinvent themselves, and this is part of life. My advice is, be aware of changes but be critical of them. I defend that Accountants will never disappear because this professional understand how Accounting works and how each decision impacts the business”.*

Respondent K: *“we need critical people, someone who can interpret the contracts and say how they will impact the books. Accountants became more strategic, closer to the business to explain how the accounts rules work.[...]Many of the Accountant’s work cannot be replaced by robots, such as the interpretation of rules or how to treat business combination”.*

As presented in the literature review, there is a theory in which technology can affect employment and lead to new employment opportunities (Petropolous, 2017). In that sense, the majority of the respondents agrees that the number of Accountants can reduce; however, it will never disappear, as exemplified as follow:

Respondent B: *“Accountants will not disappear, as they know the language of business. The Accountants help analyze information, interpretations, revisit the financial report process, audit support, and reassess new standards' impacts. Our role as an Accountant is to add value with data analysis [...] helping the decision, protect the interests of diverse stakeholders.”*

Respondent S: *“The Accountant has a much more significant role today to mitigate risk to propose the best solutions. Does it have a more strategic role, does it have a tax benefit? What is the best taxation? [...] More proximity to the objective of the business, which is increasingly dynamic, that they maintain competitiveness[...] if I keep bureaucratizing, I’m out how I support decision-makers with alternatives. It’s beyond Debit and Credit.”*

Respondent T: *“For me, the Accountant will be the consultant of the business. I see, more and more the Accountant understands more about the business”.*

The results about the impacts of the RPA tool on the Accountant’s role brought elucidations on the topic. I hypothesized that the role of Accountants has changed due to the RPA tools, and previous studies had also concluded that Accountant’s role in organizations changed (Kokina &Blanchette, 2019, Kaya et al., 2018). However, as Kruskopf et al. (2019) has emphasized, RPA is automating tasks, not jobs. Kaya et al. (2018) also state that RPA came to revolutionize the way business processes are run, removing people from non-strategic tasks. Throughout the interviews, it was possible to comprehend the impact of technology on the Accountant’s role is not new. Organizations have continually improved their way of working with new tools and technologies, as exemplified by Respondent D: *“The newer tools will only be part of Accountants job... as like when excel came... or ERP”*. The fact that we have new tools does not mean that the role will change. In the Accountant’s role, the essence of its functions has not changed with RPA. This tool surged to help Accountants play their role better, but it did not modify the nature of their work.

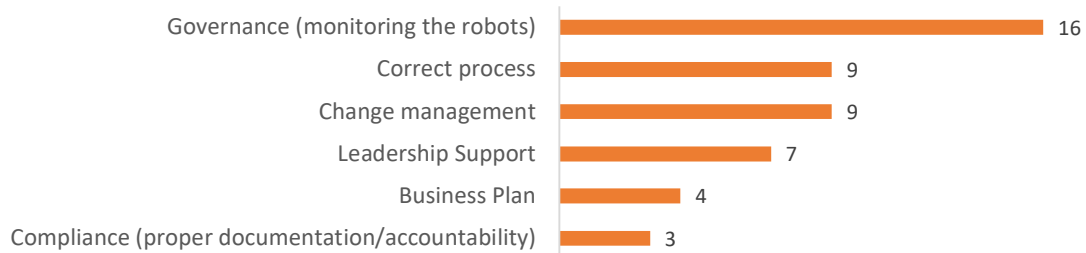
Accounting is the language used by the business to communicate to its internal and external stakeholders. Consequently, the primary Accountant’s role is to be the business advisor, their co-pilot, helping them in the decision-making process (Silva, 2019; ACCA, 2013). We noticed that most participants were aligned with previous studies’ findings of the Accountant’s role during our data collection process. Nevertheless, we perceived that many companies are still struggling to attend to the role’s objective fully. Most of the participants described the Accountant’s role as something to achieve in the future because it is not happening yet. They expect that the RPA tool will allow them to approach this objective of being a business advisor, the so-called business co-pilot, sooner.

4.5 Key Success Factors for RPA implementation

In order to capture other valuable information from the participants’ RPA journey, some open questions were dedicated to collect their positive and negative experiences on RPA

implementation. This section is dedicated to consolidating the key learnings and what was crucial to succeed in the implementation. **Figure 13** shows the keywords used by the interviewees to express what cannot be ignored during the RPA implementation plan:

Figure 13 - RPA key success factors



Source: Research's data – 20 respondents in total

The results show that a good governance practice is the most critical factor. Governance was mentioned by 16 of the participants. Two other relevant topics mentioned were choosing the correct process to automate and a good change management plan to make sure all employees understand the need for automation without being afraid of losing their jobs. Leadership support, good business plan, and compliance were also listed Below, and we have some examples of participants experience on RPA implementation:

Respondent A: *“i) identify the correct process. Many projects were started without a strategy. Questions: What will be the return of RPA? Structure the plan; ii) where to start? I know that there are activities that I can automate, but should I? Which tool should I use? Should I change the process? Is this a sustainable solution?; iii) good business plan, and iv) Governance – make sure who will have access, who will maintain the robots, and assign the role and responsibilities”.*

Respondent C: *“Change management is important—people engagement on digitalization understanding the objective and the real gains for the company.”*

Respondent D: *“we should have the support of leadership [...] review the process and documenting the process well is important”.*

Respondent F: *“20% technology and 80% is change management”*

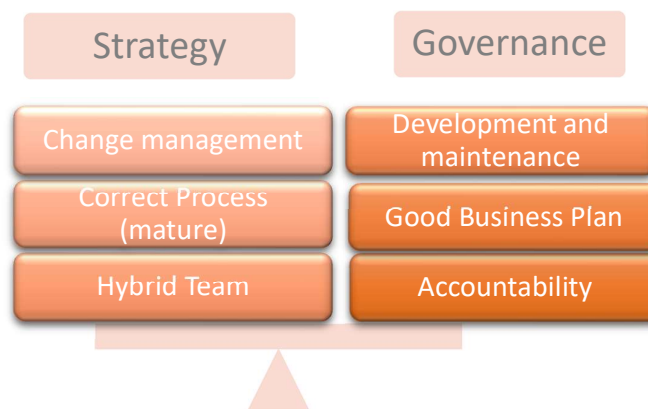
Respondent K: *“we can outsource the activities, but the responsibility cannot be outsourced.”*

Additionally, it was possible to capture some failures happening due to a flawed change management plan. As expressed by respondent E, there were scenarios where people do not understand their roles, and they do not feel responsible for the problem and as part of the solution.

Implementing RPA without other areas' involvement also was listed as a mistake. Respondent J voiced that *“to be successful, we need to have everybody involved at the beginning to help in the planning.”* Respondent P endorsed that IT should be involved in any RPA project because Finance people do not know about IT Governance.

The results show that companies have learned a lot with RPA implementation, and the perception indicates that two pillars must be carefully planned beforehand, as expressed in **figure 14**.

Figure 14 - Key success factor's pillar framework



Source: Elaborated by the author

5 FINAL CONSIDERATIONS

This study intended to understand the impacts of RPA implementation in Accounting with an outlook on the Accountant's role. It is possible to conclude that Accountants play a relevant role in organizations; however the RPA implementation in Accounting did not change their major role. On the other hand, it affected: i) the Accounting team skills requirements; ii) the tasks migration to more value-added responsibilities; iii) the change in the composition of the Accounting team in a hybrid team, with new job positions opportunities; iv) opportunity to bring the Accountants closer to their major role: guide and direct businesses in the decision-making process tactically and strategically (ACCA, 2013).

In other words, although the RPA impacted so many parts of Accounting, surprisingly, it has not changed the role of the Accountants as we had firstly hypothesized. On the contrary, RPA implementation evidenced that Accountants were not playing their role properly, and further studies could investigate the reasons for that perception. Overall, the empirical results reflecting the responses of twenty RPA experts support this contention.

Companies of all sizes should benefit from RPA implementation. When interpreting the motivations behind RPA adoption from this study that targeted large companies, we can see that the central motivation for RPA adoption is to better serve the business with data analysis and information for decision-making. Nowadays, the increasing number of RPA vendors in the market indicates that the initial barrier for small to medium companies is reduced. We suggest that future studies should be extended on this public.

All the respondents endorsed the importance of digital skills in the Accounting team. However, there was no consensus on how this skill should be leveraged. Some believed that technology should be taught to Accountants and others understood that we should bring technological specialists to the Accounting team and teach Accounting to them. Future research could investigate the pros and cons of this topic and explore how universities are adapting to these new skill requirements.

The study contributed to elucidate what is causing the misconception in which it is believed that RPA will replace humans (Daugherty & Wilson, 2018). Since manual, repetitive, transactional tasks have been automated, employees with digital capabilities are being reallocated to new tasks or projects. The result of this study endorsed that, overall, RPA is not causing employee's lay-off but migration of functions; however, it is expected that the ones that

are executing bureaucratic activities without leveraging their skills will be out of the market. Future research could explore to which extent we have Accountants doing non-Accountant tasks and how this would impact the marketplace.

Through the research, we collected valuable information from the participants to ensure a successful RPA implementation in Accounting. This could serve as a guideline for companies that want to implement RPA in the near future.

To conclude, this paper provides valuable information for Accountants, universities, and companies, in general, a perspective on the impacts of the RPA tool on their journey. Accountants could use this paper to check opportunities in their careers and invest their time in acquiring digital skillsets. Additionally, universities could review their curriculum to integrate more digital content into it, and companies can use the results to review Accounting team profiles and career development plans. Furthermore, companies in the initial stage of RPA implementation could use this paperwork to guide how to proceed to succeed.

This research's contributions must be read in light of its restrictions. Firstly, we have a methodological limitation. Although we have carefully chosen qualified respondents, this study was restricted to 20 interviewees. On the other hand, as explained in the methodology section, compared to the quantitative method, the qualitative approach produces valuable information, even with fewer interview attendants (Patton, 1987). However, the results based on the respondent's perception cannot be generalized.

The second limitation refers to the conduction of a semi-structured interview. Even though all the questionnaire objectives were answered, the interview flow depended on the interviewee's role in the RPA implementation (Implementer, Requester, or Consultants). The interviewer had to respect the participant's timing and interests, and experience. Their answers could have a different emphasis and different new topics. Furthermore, some interviews were performed in English and some in Portuguese. The respondent's quote translation from Portuguese to English could not perfectly represent what was said.

The third limitation refers to the respondents. This research considered the opinion and experiences gathered mainly from professionals of large companies in Brazil. Therefore, the responses considered in this study could differ from RPA experts working in different company sizes and locations.

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APPENDIX A – INTERVIEW GUIDE

Considerations:

- a) Can I record the interview?
- b) Can I include a summary of your curriculum to justify the importance of your testimony about the topic?
- c) You will be denominated as Participant X, and all the answers will be kept confidential.
- 1) Have you had how many years of experience with RPA in Accounting? And what were your roles in RPA in Accounting? (Implementer, Requester, or Consultants)?

Overall idea: Understand the role of the participant

- 2) In what form were/are you involved with the RPA process? How was the idea of RPA in Accounting established in the company?

Overall Idea: Motivations on implementing RPA in the company and how this hit Accounting

- 3) What were your convictions about RPA on Accounting before implementation, and what are your beliefs now?

Overall Idea: See if the application of RPA changed the participant perspective about the tool

- 4) Which skills (that you had) do you consider were central to develop an RPA in Accounting, and which ones did you have to obtain?

Overall Idea: See if the application of RPA changed the participant perspective about the tool

- 5) How was the Accounting team's engagement on the RPA implementation? Can you describe what your perceptions were? Did you feel differences between Seniors' and Juniors' participation?

Overall Idea: How was the acceptability of RPA within the team. Describe RPA impact on Juniors/Seniors

- 6) What have you seen as a consequence of RPA implementation in Accounting?

People/ Process/ Reports

Overall idea: Understand the consequences of RPA in the Accounting structure.

- Did it reduce the number of employees, their qualifications, the competencies required?

- Did the process improved?

- Did the quality (free of error, quicker) of information improved?

- 7) Did you have to hire new people in the area? For which responsibility? Did the RPA experience change the required skills to work in the area?

Overall idea: Understand the changes in the area after RPA implementation and the new qualifications required in the area.

- 8) In your experience, what would be the barriers to an RPA implementation in Accounting?

Overall idea: Get an overview of the difficulties of implementing RPA in Accounting

- 9) Have you faced failures in the implementation? What do you think were the causes? What were the lessons learned?

Overall idea: Get an overview of the difficulties of implementing RPA in Accounting

- 10) How should the Accounting area assure governance/compliance on their process after RPA implementation?

Overall idea: Controls to assure the RPA outputs

- 11) What would be the key factors for a successful RPA implementation in Accounting?

Overall idea: Probably this answer will be complemented by question 8

- 12) Do you believe the role of Accountants will change? If yes, how would you describe the new role of Accountants?

Overall idea: Wrap up of the meeting.

APPENDIX B – INTERVIEW ANSWERS TABULATION

RPA Motivation

Motivation	Interviewees																			Mentioned # Interviewees
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Productivity	1	1	1	1				1		1	1	1	1		1	1			1	12
Efficiency	1		1		1	1	1	1		1			1	1	1		1		1	12
Reduce employee workload			1	1	1			1			1				1	1	1		1	11
Reduce Errors		1		1		1		1	1							1	1	1		8
Scalability	1	1			1	1		1		1	1	1								7
Better data quality						1		1		1							1		1	6
Cost Reduction	1											1	1			1	1			5
Reallocate employees to more complex activities	1	1			1						1								1	5
Provide better service/product to customers	1					1			1								1			4
Standardize Processes			1			1										1			1	4
Competitiveness	1										1		1		1					4
Senior Leadership goal							1		1		1									3
Meet closing deadline					1															1
Quicker ROI							1													1

Accountants Skills and Capabilities

Accountant's Skills searched	Interviewees																			Mentioned # Interviewees
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Technology fluency	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1		1	18
Functional knowledge of RPA	1						1		1	1	1	1	1	1		1	1	1	1	13
Hard skills - Accounting		1		1	1	1			1	1	1			1	1	1		1	1	13
Business understanding	1	1	1		1				1			1	1	1	1		1		1	12
Technic skills to Program RPA	1	1		1		1	1	1		1	1				1	1			1	11
Problem Solver	1		1		1	1	1	1					1	1				1	1	10
Data Analytics skills	1			1	1	1			1	1	1	1					1		1	10
Curious	1	1					1		1							1		1	1	7
Team player				1	1		1										1		1	5

[illegible]