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LEYLIANNE MALAQUIAS RABELO

NEW TECHNOLOGIES: THREATS Vs. OPPORTUNITIES FOR THE ACCOUNTING PROFESSION

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2020

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Dissertation presented to the Post-Graduate Program in Accounting of the Federal University of Pernambuco, as qualification requirement for the Master´s Degree in Accounting title.

Advisor: Cláudio Wanderley, PhD

Co-Advisor: Katherine Elizabeth Horton, PhD

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Dissertation presented to the Post-Graduate Program in Accounting of the Federal University of Pernambuco and approved on February 17th, 2020.

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“And if I have prophetic powers, and understand all mysteries and all knowledge, and if I have all faith, so as to remove mountains, but have not love, I am nothing.”

(1 Cor 13:2)

ABSTRACT

The present research was inspired by Farrar's white paper: Re-inventing finance for a digital world. (CGMA, 2019) which was a global research with more than 5,500 finance professionals from over 2,000 organizations in over 150 countries. Focusing on Brazilian accountants, the objective of this research was to measure if new technologies were generally perceived to be a threat or an opportunity. Moreover, the aim was to examine if technology readiness, business partner roles, career adaptability, and age had significant correlations with the sense of opportunity and threat. Through Google docs and using personal contacts and Linkedin connections a questionnaire was conducted with 473 respondents. The findings indicated that the Brazilian accountants' knowledge about new technologies was above 56% and their sense of new technologies being critical to transform organizations was above 29%. However, when we examined the accountants' usage of a range of new technologies such as cloud computing, process robotics, visualization, advanced analytics cognitive computing, in-memory computing and blockchain, we found that usage was limited. Specifically, only cloud computing was used by more than 13% of the accountants surveyed. Also, as predicted, technology readiness, and career adaptability were significantly positively correlated with the sense of opportunity, and significantly negatively correlated with the sense of job insecurity, while business partner was only significantly correlated (positively) with opportunity, and age was only significantly correlated (positively) with the sense of stress. In sum, Brazilian accountants still have a way to go before being considered integrated with the new technological reality.

Keywords: New Technology, Threats, Opportunities, Accounting profession

RESUMO

A presente pesquisa foi inspirada pelo artigo técnico de Farrar: *Re-inventing finance for a digital world*. (CGMA, 2019) que foi uma pesquisa global com mais de 5,500 profissionais de finanças de mais de 2.000 organizações em mais de 150 países. Focando nos contadores brasileiros, o objetivo dessa pesquisa foi de mensurar se novas tecnologias são geralmente percebidas como ameaças ou oportunidades. Além disso, o objetivo foi examinar se prontidão à tecnologia, a função de parceiro de negócios, adaptabilidade de carreira e idade têm correlação significante com os sensos de oportunidade e ameaça. Através do Google doc e utilizando contatos pessoais e conexões do Linkedin, foi realizada uma pesquisa com 473 respondentes. Os achados indicaram que o conhecimento dos contadores brasileiros a respeito das novas tecnologias é acima de 56%, e que a sensação deles que as novas tecnologias serão críticas para transformar as organizações é acima de 29%. Entretanto, quando examinamos a utilização dos contadores de um roll de tecnologias, tais como computação em nuvem, robótica de processos, visualização, análise avançadas, computação cognitiva, computação em memória e *blockchain*, apenas computação em nuvem era utilizada por mais de 13% dos contadores pesquisados. Também, como previsto, prontidão à tecnologia e adaptabilidade de carreira foram positivamente significantes para o senso de oportunidade e negativamente significante para o senso de insegurança do trabalho, enquanto parceiro de negócios apenas teve correlação (positiva) com oportunidade e idade apenas teve correlação (positiva) com senso de ameaça percebida. Em suma, contadores brasileiros ainda têm um caminho a seguir antes de serem considerados integrados à nova realidade tecnológica.

Palavras-chave: Novas tecnologias, Ameaças, Oportunidades, Profissão contábil

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LIST OF ACRONYMS

AICPA – Association of International Certified Professional Accountants

CIMA – Chartered Institute of Management Accountants

CAAS – Career Adapt-Abilities Scale

CGMA – Chartered Global Management Accountant

ICAEW – Institute of Chartered Accountants in England and Wales

ACCA – Association of Chartered Certified Accountants

CFC – Federal Accounting Board

SEBRAE - Brazilian Micro and Small Business Support Service

PWC – PricewhaterhouseCoopers

Summary

1. INTRODUCTION

Modern society is profoundly rooted in technology, not only inside companies, but in daily life (Dufva and Dufva, 2019; Zhang, 2018; Dimitriu and Matei, 2015; Belfo and Trigo, 2013; Bendovischi, 2015). People all over the world use connected devices, generating an unprecedented amount of information. Connected civilization also calls for high speed answers, and this context is incompatible with annual or even monthly financial reports. "The market place for services creates pressure for change. It demands new services, techniques and products. These require the people in a profession to learn new skills, take new approaches and refocus their priorities" (Allott et al., 2000, p.131). In other words, in order to achieve the needs and requests of financial reports' users, accountants are facing the need to review their procedures, mindsets and skills.

One source of changing pressure is the technological development. For example, in 1998, Odgers and Nimmervoll already recognized the impact of technologies on accounting and stated that: "given the speed of change in technological innovation, accounting practices and standards should be regularly reviewed" (Odgers and Nimmeryoll, 1988, p.117). Janvrin and Weidenmier (2017) aimed to shed light on the relationship between accounting and technologies. They considered that accountants always tried to make sense of a large amount of data, despite being hand-made or highly technically collected, analyzed and interpreted. In order to do so, accountants always sought to use emerging technologies. (Chua, 2013). Finally, this concept can be complemented by Zainuddin and Sulaiman (2016, p.468) who report: "Rapid progress of information technology gives 'signal(s)' to management accountants to become more aware of the availability for more accurate, timely and relevant information in the future".

The current moment is a peak of change for accountants, since there are, at the same time, core modernization tools, which focus on increasing financial tools' results, and exponential tools, which provide new capabilities for the finance function. (For further information, see Farrar, 2018b). In this context, it is normal to expect accountants to improve their technological skills. Especially in terms of becoming knowledgeable about new disruptive[1] technologies and their informational potential. However, new technologies bring new challenges, such as developing the appropriate technical skills,

[1] Disruptive – causing or tending to cause disruption, innovative or groundbreaking. https://en.oxforddictionaries.com/definition/disruptive

understanding the volatile desires of stakeholders, implementing radical changes in the daily modus operandi, and overall, facing the risk of activities automation.

In addition, new technologies are considered an engine to move accountants from their focus on cost controlling (past information provider) to a decision counselor (Simons, 2018b; Parker, 2002; Pan et al., 2015; Pan and Seow, 2016; Sutton, 2000; Allot et al., 2000). The new accountant's role is known as a business partner (Simons, 2018a; Parker, 2002; Farrar 2019; Pietrzak and Wnuk-pel, 2015; Jones and Glover, 2018; Pan et al, 2015). However, Pan et al. (2015) highlight that the real challenge is not just to provide insights for better decisions, but to do so while ensuring effective control of the enterprise (risk management and stewardship roles). In order to achieve all these objectives, "traditional accounting departments may have to rely on data analytics to transform themselves into 'intelligent accounting functions'" (Pan et al., 2015 p.10). In other words, "for the finance professional, the automation of repetitive tasks will free up their time to concentrate on creating and preserving business value" (Farrar, 2018 p.5).

The changing of accountants' roles represents the reality, to such a degree that researchers are pointing to the need to increase the knowledge of new technologies and how to use them as a must for accountants' future (Parker, 2002; Farrar, 2019; Pietrzak and Wnuk-pel, 2015, Farrar, 2018).

All of this considered, "management accountants have a critical role to play in developing the digital strategy that will be essential to the ongoing success of their organization(s)" (Farrar, 2018, p.8).

1.1. Research Question

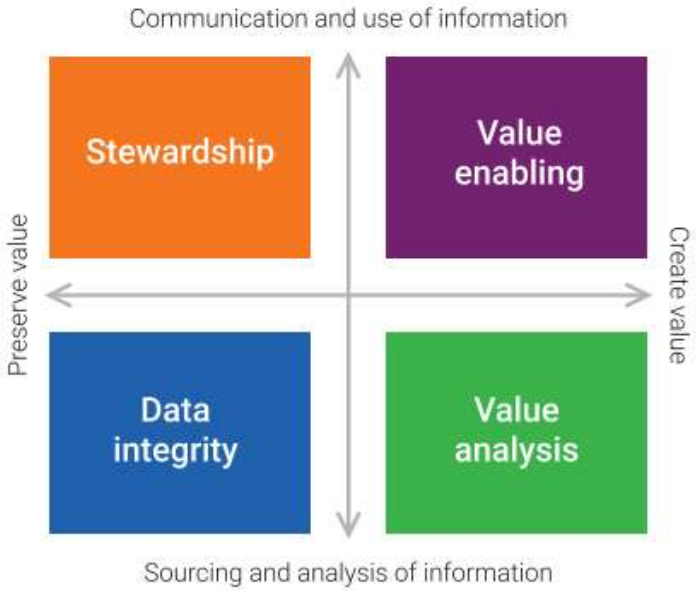
In the beginning, the focus of accounting was on producing accurate financial reports. Ahid and Augustine (2012) explain that "the traditional definition of management accounting describes management accounting based on the fact of providing information to the managers, so management accountants were considered as information providers" (p.43). This classical accountant role of bookkeeping is commonly labelled in the literature as a bean counter. Granlund and Lukka (1997, as cited in Vaivio and Terhi, 2006, p.52) defined bean counter "…as a type of person who aims to write accurate and correct financial history, who responds to formal information needs, whose personal communication is usually limited to the accounting function and whose communication to the organizational exterior of the accounting function concentrates on written reports". Friedman and Lyne (2001, p.446) argued that: "the image of the accountant originally

was of someone narrowly and methodically concerned with producing numbers". And they commented: "The image of the bean counter who is single-mindedly preoccupied with precision and form, methodical and conservative, and a boring joyless character has, until recently, been widely recognized as the clear stereotype of the accountant" (2001, p.423). Summing up, the bean counter role refers to accountants' routine activities.

For some authors, technological development is an answer to increased competitiveness, as a consequence of global business activities (Ahid and Augustine, 2012, Waweru, 2010,). Other authors credit increased competitiveness to technological development (Howieson, 2003, Trigo et al., 2014, Campbell and Helleloid, 2002, Lissitsa and Chachashvili-Bolotin, 2016, Farrar, 2019). Despite its origin, increased competitiveness is a global dimension, leading to expected changes in accounting in order to keep its usefulness. As an example, see Daraban's quotation (2017 p.162): "Management accounting is the business partner that delivers reliable and accurate data and information for the business decision process that is more and more influenced by globalization, internationalization and accelerating and dynamic markets". Another way to put this changing role of accounting is that it, "is on the way to asserting itself as a proactive business value driver for modern 21st century business organizations" (Daraban, 2017, p.162). The new expectations about accountants' roles has brought a new nomenclature: business partner. For Chartered Accountants Ireland, "finance business partners are accountants who work closely with a particular business unit creating real and active partnership with both operations and management. Their role is to provide 'real time' support and analysis, to be a trusted adviser and to add value that will assist in decision making" (2015, p.1).

The accountant's metamorphosis from a bean counter to a business partner is directly influenced by new technologies. Be it as a cause of these changes, or as a tool to answer to these changes. This current circumstance has the potential to be considered as a threat or an opportunity. One can argue how could one factor represent both opposite sides? To answer this hypothetical question, it is necessary to understand the multitude of tasks under accountants' responsibilities. Simons (2018b, p.4) listed four broad finance roles, which are reporting (trusted source providing data integrity), questioning (commercial analyst), developing solutions (expert providing stewardship) and deploying solutions (partnering for value), and developed the finance function value matrix (see figure 1).

Figure 1 – The finance function value matrix

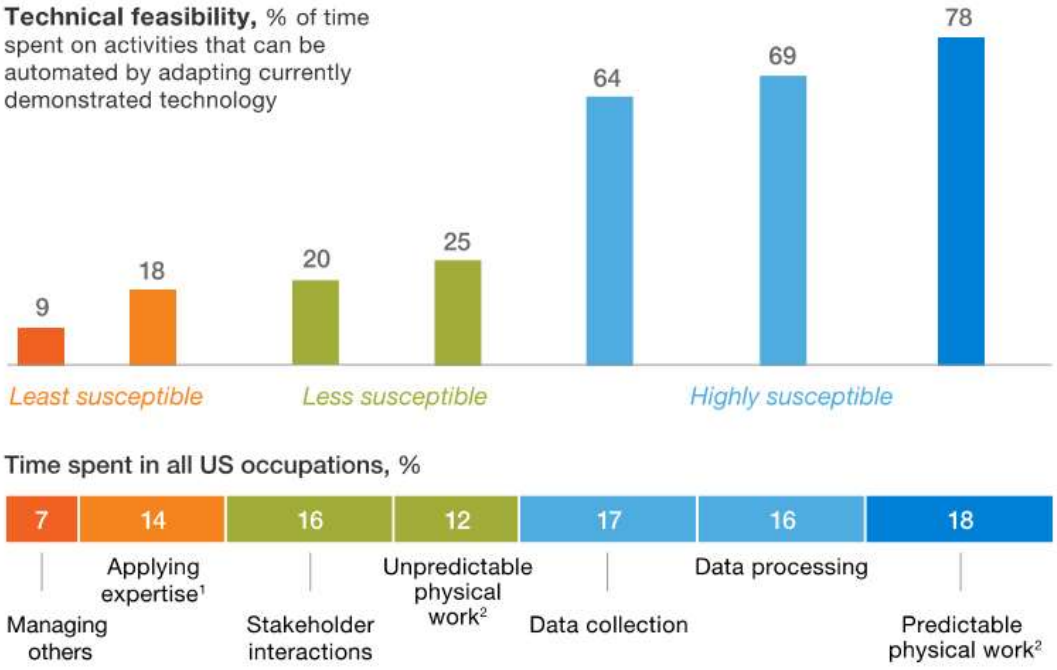


Source: Simons (2018b, p.5)

Analyzing Simons' (2018b) finance function value matrix, it is noticeable that reporting (data integrity) and developing solutions (stewardship) relate to preserving a company´s value, while questioning (value enabling) and deploying solutions (value analysis) relate to creating value. That is, the accountant can or should be responsible for preserving and creating value. So, for different categories of responsibilities, or even for different accountants' profiles, new technologies can represent different perspectives.

Chui and Miremade in 2016 studied the technical feasibility of automation and summarized it in figure two below.

Figure 2 – Technical feasibility



Source: Chui and Miremade (2016, p.3)

Considering Chui and Miremade's (2016) findings and Simons' (2018b) finance function matrix, reporting and developing solutions are highly susceptible to automation. Atalay et al.'s (2018, p.49) study found that "ICTs[2] tend to substitute for routine tasks (especially routine manual tasks) which are disproportionately performed by low skilled workers". Estlund (2017) put this threat in a clear perspective:

> We might now face a future of shrinking employment opportunities and falling wages for workers whose skills are being replicated or surpassed by ever smarter and more cost-effective machines. Given current social and economic arrangements, that is a devastating prospect for the vast majority of people in our society who depend on paid work for their livelihood and the material support of their dependents (p.325).

Despite the threat perspective presented by some authors, Brynjolfsson and McAfee's (2014) study presents a balanced point of view, bringing not only the threatening

[2] Information and Communication Technologies (Atalay et al., 2018, p.48)

automation perspectives, but also the opportunities. Their following quotes put things in a different perspective: “this leads to job polarization: a collapse in demand for middle-income jobs, while nonroutine cognitive jobs (such as financial analysis) and nonroutine manual jobs (like hairdressing) have held up relatively well.”. And “…we’ve seen that skill-biased technical change has increased the relative demand for highly educated workers while reducing demand for less educated workers whose jobs frequently involve routine cognitive and manual tasks.” Finally, “while technological progress and other factors definitely cause some workers to lose their jobs, the fundamentally creative nature of capitalism creates other, usually better, opportunities for them”. Still discussing about the balanced shape of the current moment, Chui and Miremade’s (2016) study showed that activities involving managing and developing people and those who need expertise for decision making, planning or creative work are less susceptible to automation. The smaller feasibility of automation of these specific tasks and also the possibility of performing non-routine tasks can be seen as opportunities “because new technologies increase the demand for nonroutine analytic tasks. … ICTs also allow high skill workers to focus on the activities in which they are most productive” (Atalay et al., 2018, p.49).

Another point of view about new technologies adoption is the possibility of freeing time from routine tasks and being able to focus on more analytical ones (Graham et al., 2012, Chua, 2013, Pan et al., 2015, Farrar, 2019). This focus on analytical tasks, that is, “the shift from preserving value to creating value highlights the prospect of a rewarding career in finance – a shift in which they can add real value to organizations and society as a whole” (Farrar, 2019, p.1).

Given that the future of accounting is changing, pushed by new technologies, this study aims to identify if accountants perceive the new technologies as threats or opportunities. The main contributions will be to examine Brazilian accountants’ knowledge and usage of new technologies, their views of future implementations and the extent to which there is some level of job insecurity related to the implementation of new technologies. Summing up, the research question can be defined as: **Are new technologies seen as threats or opportunities by Brazilian accountants in the development of their careers?**

1.2.Objectives

To develop the study, the main objective and specific objectives have been established.

1.2.1. Main Objective:

To identify Brazilian accountants' perceptions about new technologies in terms of threats or opportunities for the development of the accounting profession.

1.2.2. Specific Objectives:

- To investigate Brazilian accountants' level of comprehension and familiarity with new technologies;
- To analyze the usage level of new technologies amongst Brazilian accountants;
- To investigate if technological readiness and career adaptability, as personal skills, influence how Brazilian accountants perceive new technologies;
- To examine if professional variables such as bean counter or business partner roles are correlated with Brazilian accountants' perceptions of new technologies;
- To examine if age is associated with Brazilian accountants' perceptions of new technologies.

1.3. Motivations and Contributions

Accountants may be on the verge of a shock to their professional realities, pushed by new technologies. This is not the first time such a jolt has occurred to accountants. In the recent past, the Enterprise Resource Planning (ERP) implementation also represented a great change and was researched by practitioners and scholars. However, there is a noticeable difference in the boundaries of the new technologies. In the past, the ERP brought new dimensions to internal business processes and initial changes to external relationships. Actually, the whole of society is changing with new technologies, and even future customers, with which the companies do not have relationships yet, will be affected by them.

This deep change in accounting motivated the Chartered Global Management Accountant (CGMA) to perform a global research project "to understand the future needs of businesses and employers globally in a digital world, to gain insight into the finance function in a digital world, to understand how new competencies are emerging in a digital world and to signpost the competency implications for finance professionals" (Farrar, 2019, p.2). Accountants are immersed in new technologies in their personal lives, with the future perspective of implementation of disruptive technologies in their professional lives. Chui and Miremade (2016) call on executives to prepare for the future: "To get

ready for automation's advances tomorrow, executives must challenge themselves to understand the data and automation technologies on the horizon today" (p.13). In the same direction, Farrar (2019, p.32) brings a broad definition of the future expectations of accountants.

> "Throughout, there is still a need for finance professionals to have technical skills and to be able to apply them within a business context. Similarly, they need to use people skills to influence people and leadership skills to continue to lead organisations. All of these things must be underpinned by ethics, integrity and professionalism. Finance professionals will need to use their competencies to learn how to manage the finance function in a digital world. This will require a deeper understanding of the technologies, algorithms, data and organisational structures that are emerging in the digital age."

Considering the Farrar (2019) statement above, there is a lot about technical and leadership skills involved in the finance profession. But, how do accountants see their future perspectives? Do these new technologies generate a sense of opportunity to create value, or are they a source of job insecurity and threat? So far, the literature paid little attention to the psychological impact of the pressure on accountants may face due to the disruptive technologies. Hence, the main aim of this study is to try to identify if these new technologies are seen as threats or opportunities, and if the perspective of future implementations of them are related to a sense of job insecurity.

Job insecurity relates to the personal wellbeing of workforce members in a broad spectrum. It relates to health problems, such as depression and anxiety (Statistics, 2018, Chirumbolo and Hellgren, 2003, Reisel et al., 2010, Feijóo, 2004 and Størseth, 2006), as well as perceptions about job satisfaction and turnover (Chirumbolo and Hellgren, 2003, Reisel et al., 2010 and Størseth, 2006). However, job insecurity also relates to performance, and it is of much interest to organizations. For example, Azadeh and Ahranjani's (2014, p.343) study relates "performances of Iranian thermal power with respect to human factors such as job stress, satisfaction and security". The authors conclude that "job security, satisfaction and stress have considerable impact on performance of generation companies". And that "job security was the most effective

factor" (p.347). Other authors claim that job insecurity is negatively related to performance (Chirumbolo and Hellgren, 2003; Reisel et al., 2010). It can be understood since the overall company's performance is deeply influenced by the performance of each employee. In other words, behavioral studies bring different variables to old equations about performance and can be of high value to understand the present moment and help to prepare for the future.

The time of this study is opportune, since new technologies are being discussed and implemented nowadays. Or, in Sher et al.'s (2018, p.24) words:

> "None of us knows for certain what the future will hold, but we all have a responsibility to be thinking about what's likely to happen, and to prepare for it. In Finance, that means working now to get the right people and technology in place to take advantage of the inevitable disruption ahead."

This study provides some practical contributions. Specifically it: (1) brings the discussion about new technologies to Brazilian accountants, offering new knowledge about the subject, (2) measures levels of comprehension, familiarity and usage of new technologies among Brazilian accountants, which can help to identify if there is some knowledge gap, which can be used as a source of future accounting training. Also, in the behavioral field, the study will look for relationships between job insecurity and the future implementation of new technologies, since job insecurity is negatively related to job satisfaction, which can lead to organizational behavior changes (Reisel et al., 2010; Emberland and Rundmo, 2010). This last point has the potential to highlight the humanistic perspective of the big change in the accounting profession and open opportunities to elaborate a holistic training plan, where not only the technical capability will be a focus, but also the emotional intelligence to deal with the challenging change. Finally, the study provides a multidisciplinary point of view on Brazilian accountants' perspectives of the future, with technical and behavioral approaches.

1.4. Structure

This thesis consists of 5 chapters with sections and subsections. In the introduction, the research question, the objectives and the motivations and contributions are detailed. The second chapter consists of a literature review and an explanation of the hypotheses.

This includes the theoretical background of this study, a description of the accounting function and its evolution through the years. In addition, it discusses the interaction between technology and accounting, and lastly, it presents the hypotheses, which are based on the extant literature. In the third chapter we describe the methodological procedures adopted to proceed with this research, with subsections including the research approach, the investigation technique, a summary of research stages, the explanation of structures of the research instruments, the measures, and data treatment and analysis. In the fourth chapter, the results of descriptive and inferential analysis are shown and each finding is discussed. Finally, chapter 5 contains the conclusion, with this study's contributions, limitations and suggestions for future research.

2. LITERATURE REVIEW AND HYPOTESES

This section presents a theoretical discussion about the relationship between developments in the accounting profession and new technologies. The objective is to highlight the main concepts under study. First of all, I will present a definition of the accountants' roles, and professional evolution. After that, I will discuss a group of new technologies that are expected to impact the future of accounting and lastly, I will discuss some studies relating to the impact of past new technologies (such as ERP) on the accounting profession.

2.1 The Accounting Function

In literature, management accounting (MA) and financial accounting (FA) are most of the time, considered as two different fields of study, and the business partner tasks are normally accredited to management accounting, whose development is summarized below.

In 1981, the Institute of Management Accountants issued its first statements on the management accounting profession, defining management accounting as:

> "the process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication of financial information used by management to plan, evaluate, and control an organization and to assure appropriate use of and accountability for its resources. Management accounting also

> comprises the preparation of financial reports for non-management groups such as shareholders, creditor, regulatory agencies, and tax authorities" (Institute of Management Accountants, 2008 p.1)

In 2008, the Institute of Management Accountants issued an accounting statement with a new definition of management accounting (Institute of Management Accountants, 2008 p.1):

> "Management accounting is a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy."

To understand the reasons behind the management accounting definition change, it is important to understand its main core. The Global Management Accounting Principles define management accounting as "the sourcing, analysis, communication and use of decision-relevant financial and non-financial information to generate and preserve value for organizations" (Simons, 2018b, p.5). The focal point is to keep providing useful information. Its usefulness is profoundly dictated by the external environment and its impact on business needs and models.

Bragg (2011) enumerated six functions of controllership, which are planning, organizing, directing, measuring, financial analysis and process analysis. The first four are described as common to any manager roles, and relate to defining who does the work and when, defining and controlling the budget (planning), obtaining skilled staff, equipment and structural needs to do the tasks (organizing), keeping the staff connected to objectives (directing) and measuring performances and results (measuring). However, reviewing, interpreting and suggesting recommendations about financial performance and reviewing and evaluating the main company´s processes are specific functions of controllers. Bragg (2011) also defined the controllers' areas of responsibilities as shown in figure 3:

Figure 3 – Controllers' responsibilities

Area	Responsibilities
Auditing	Internal audits; Support to external auditors
Budgeting	Coordinating the process; Maintenance of budget
Cost accounting	Measure; Review; Control
Financial analysis	Comparison between Budgeted and actual results; Review of revenue and expenses; Calculation of indicator of corporate performance; Communication of results; Recommendations for improvement
Financial statements	Preparation of financial statements; Interpretive analysis; Distribution of reports
Fixed assets	Annual audit; Classification, record and depreciation; Review for impairment; Analysis of capital expenditure requests
Policies and procedures	Creation, maintenance and training of policies and procedures related to control of the company; Observation to government requirements
Process analysis	Periodic review of financial analyses processes'
Record keeping	Indexing, storage and retrieval of accounting documents, including destruction
Tax preparation	Supervision of all issues related to taxation
Transaction processing	Timely completion of accounting transactions and all transactions authorized by the board of directors

Source: Brag (2011)

Finally, Bragg (2011) defined the qualifications needed for controllers to fulfill their tasks: Analysis of information; Communication ability; Company and industry knowledge; Management skill; Provision of timely and cost-effective services and Technical knowledge. Considering the newly available technologies, and the expectations about how accountants will deal with them, the qualifications listed by Bragg (2011) seems to be mandatory. Earlier, in 2009, Bragg stated: "The controller is expected to apply sound accounting principles and practices within the company, as well as to stay current in the latest technological advances, so that this can be done in the most effective and efficient manner possible" (p.16). Or, in Ovunda's (2015, p.1896) words: "management accountants are strongly advised to adapt themselves and their practices to supply appropriate information for decision making purposes".

Because of profound changes in the environment, accountants also face changes (Taipaleenmäki and Ikäheimo, 2013; Emsley, 2005; Daraban, 2017; Pietrzak and Wnuk-pel, 2015). Authors concerned with management accounting's evolution have highlighted some strong characteristics throughout time (Ashton et al., 1995, Bhimani and Bromwich, 2010, Nixon and Burns, 2012, and Nishimura, 2019). In 1988, the International Federation of Accountants (IFAC) stated four stages of managerial accounting which are acknowledged and presented by various authors (Abdel-Kader and Luther, 2006, Padoveze, 2006, Prakash, 2013, Ovunda, 2015 and Shuo and Jian, 2015). Something to be aware of is the fact presented in IFAC's statement and cited by Abdel-Kader and Luther, (2006, p.3) and Padoveze (2006) that each successive stage encompasses the concepts of the previous stage, and incorporates additional ones that arose out of a new set of conditions. For illustrative purposes, we have elaborated on this further in figure 4, which presents the main characteristics for each period. However, it is important to take note that not all authors pointed to exactly the same starting and breaking times.

Figure 4 – Stages of management accounting

Period	Focus	Economic characteristic
Pre 1950	Recording financial information; Budgeting and cost controlling; valuation of inventories for financial accounting purposes	Classical period; Concern with internal matters
1950-1960	Internal matters, especially production capacity; Inefficient and poor management practices were common in many industries; Long range planning; Provide information for managerial plan and control	Competition on the basis of price or quality was relatively low, increased cost could often be passed on to customers; Company diversification creating conglomerates
1970s	Design, maintenance and interpretation of information systems; Need of change styles of management that are flexible and responsive to change; Waste reducing; Strategic planning	Worldwide recession, oil price shock of 1973; Decline in protected markets and increased global competition; New technologies reduced cost and improved quality whit far labour; Emergence of the personal computer; Increased scientific knowledge created new markets;

1980s	New management and production techniques and controlling costs often through reducing labour costs; Down-sizing (controlling costs with less managerial input); Ensure to provide the diffusion of information around the company; Cost controlling	New competition with modernized and more cost-effective companies through the use of new technologies; Decline in manufacturing industry and increase in non-manufacturing sectors; Employees being empowered to be able to take decisions themselves; Foreign competition leading to globalization;
1990s	Information flows are needed at all levels of the organization; Re-exam knowledge and methods; Value creation by improving the efficiency of resource usage; Balanced Scorecard; Customer Relationship Management; Levers of Control	Increasing role in the restructuring, privatization and commercialization of the public sector; Globalization of trade is beginning to be accompanied by an internationalization of accounting knowledge; Unprecedent advances in manufacturing and information-processing technologies; Economic and political change in the international environment
2000 (contemporary)	Forecast based on historical information analysis; Observation on customer and shareholder value; Strategy Maps; Supply Chain Management; Complex Adaptive Systems; Strategic Entrepreneurship; Intellectual Capital and Knowledge Management; Corporate Governance; IT Systems, 'Big Data', 'Cloud' Computing, 'Smarter' Machines	Rise of the knowledge worker and the knowledge-based organization; E-Commerce and internet-based corporation with small staff numbers. Global financial crisis that erupted in 2008 heightens economic uncertainty and calls into question the priorities shaping capitalism

Sources: A synthesis of multiple publications, especially Ashton et al. (1995); Abdel-Kader and Luther, (2006); Nixon and Burns (2012); Shuo and Jian (2015); Ovunda (2015).

For Kulesza et al. (2011, p.111) "the later part of the 20th century experienced extreme changes in the manufacturing environment." Because of that, "businesses saw the need to develop and implement accounting methods and work processes to contend with the realities of this changing market place".

Curiously, only Nixon and Burns (2012) stated specific characteristics for 2000 onwards, while Shuo and Jian (2015) cited the contemporary world and both insights were presented in figure 4 above. Maybe researchers will only clearly understand which are the 21th century's main characteristics and the respective role of accountants in the future. While it was not cited as a new stage of accounting professional development, the current moment of being a business partner also has its own characteristics.

In order to better understand the actual role of accountants, the Chartered Global Management Accountant issued the Global Management Accounting principles[3], which are: 1 – Influence (communication provides insight that is influential) - clearer strategy, tailored communication and better decisions; 2 – Relevance (information is relevant) – separate good from bad, quality meets accuracy and information agnostic[4]; 3 – Analyse (impact on value is analysed) – better-informed decisions, prioritized action; 4 – Trust (stewardship builds trust) – accountability meets credibility, sustainability and integrity meets ethics. In 2015, CGMA issued the paper "Finance Business Partnering: the Conversations that Count", as a compilation of the business partnering role of the management accountant. In 2018 the paper was issued again, under the name "Building A Better Business, Together. Welcome to finance business partnering". It presents how finance business partnering improves decision-making, on a macro level at first, then on a more detailed one. See below:

<u>Core modernization</u>

- Supporting decisions at group level
  a) cascading leadership

[3] https://www.cgma.org/resources/reports/globalmanagementaccountingprinciples

[4] **Agnostic**, in an information technology (IT) context, refers to something that is generalized so that it is interoperable among various systems. The term can refer not only to software and hardware, but also to business processes or practices. Retrieved from https://whatis.techtarget.com/definition/agnostic in 05/01/19.

b) supporting change management

- Decision support at business unit level
  a) planning and budgeting
  b) supporting big decisions (capital expenditure and merger and acquisitions)
  c) supporting regular ad hoc decisions (promotion and advertising expenditure; new product or new market initiatives; new project appraisal; buy or build decisions; pricing products or contracts)
- Performance management
  a) cost leadership (budgetary control; process management; resource allocation)
  b) performance appraisal (tackling sub-optimal performance; addressing gaming; ensuring alignment of Key Performance Indicators (KPI); balancing short-term versus long-term; managing intangibles)
  c) project management
  d) risk management

As seen before, the accountant's development is indissociable from the economic environment and business needs. The big revolution to modern society is the era of digital information, which is reshaping business models, and consequently, the accounting profession. This is the reason why "there is a consensus that management accountants are gravitating toward the "business partner" model and away from the "bean counter" model because of the demand for critical analyses and assistance to support the strategic and operational decision-making process" (Jones and Glover, 2018, p.305).

In other words, one could say that the main characteristic of accounting in the last decade is the urge to become even more involved with decision making, thus, in line with the role of a business partner.

2.2 Technology and Accounting

Chua (2013, p.3) says: "Accountants have always exploited emerging technologies to help them to complete their tasks more accurately, quickly or simply: from the incised clay tablets of the Sumerian scribes, through to the adding machines of the 19th century, to the calculators and computers of the 20th century". In other words, accounting development is indissociable from information technologies advances and it can be explained by (internal) organizational factors and (external) environmental factors (Zainuddin and Sulaiman, 2016). As a possible internal factor, there is the need to deal

with the unstoppable growing amount of data in a timely way, which could be impossible without computer systems, such as personal use of electronic gadgets by the accountants, since they are immersed in the informational era (Chua, 2013).

On the other hand, in terms of external factors, it is possible to claim that meeting the stakeholders' (investors, managers, government and suppliers) wishes and attitudes, besides offering good quality services is a way to maintain competitiveness. But to what extent are contemporaneous new technologies expected to impact on accounting? Figure 5 represents a synoptic picture based on the Chua (2013). Please note that payment systems, cyber security and augmented and virtual reality were not included in the synoptic figure, since they are not commonly mentioned in the literature about the relationships between new technologies and the accounting profession.

Figure 5 – Synoptic picture

Technology	Description	Opportunities	Challenges
Mobility	People´s interconnection by internet and IT resources	Faster and more connected workforce across the globe; Improved productivity and efficiency gains; Improved client serving; Exploit Generation Y workforce to leverage technologies across business	The profession must understand which services are best delivered 'on the move'; Security concerns on potential theft or loss of information; Implementing the right mobile technology at the right time is paramount; Working patterns will change as the internet becomes more pervasive
Cloud	Network of interactive computing platform	Ease of access, scalability, data sharing and collaboration; Reduced up-front costs and management overheads; Fewer physical and logical space constraints; Basis for developing new	False perception that pay-as-you go is 'cheaper' than other ways to resource IT; Difficult to monitor/control/analyse IT costs (particularly for infrastructure); Inadequacy of traditional approaches to IT cost/benefit analysis;

		products and services	Expectation that IT systems will be available online (often 24/7)
Social collaboration	Personal tools for communication and collaboration	Removing barriers to communication; Speeding up month-end processes; Enhance decision-making and productivity; Opening up new routes to investment	Removing barriers to communication; Risk to sensitive corporate data; Positioning finance as strategically important; Assessing and explaining the financial implications of new developments
Digital service delivery	IT architectures and technologies to deliver web-based business processes, e-commerce, mobile commerce, and cloud-based software and services using the internet and intranets	Potential to transform efficiency and customer satisfaction; Business models can be automated and streamlined; Global standardization; The cost of public service delivery and compliance can be minimised	Digital connectivity is central to cultures and hence business models; Robust business cases can be hard to build; Lack of interoperability of legacy systems; Time taken to develop classifications; Financial benefits can be hard to unlock
Big data	Vast amount of structured and unstructured data from internet	Improve understanding of market conditions, forward planning and risks; Potential to increase business effectiveness and lower process costs; Transform audit and forensic accounting by improving corporate; Level playing field for small	Shortage of data mining and interpretation skills; Knowing which questions to ask to gain insights; Affordability, interoperability and standards; Obtaining high quality data. Lots of data is not the answer; Data security, privacy and other important legal issues

		business and larger organisations	
Robotics	System that contains sensors, control systems, manipulators, power supplies and software to perform a task	The capacity to improve personal and professional lives; Separating skill and expertise from the people and professionals who possess it; Human brakes and overrides are needed	Robots are only as smart as their designers-today; Self-learning systems make progressively higher-level judgement calls; Where accountancy is most rule-based it is easiest to automate
Artificial intelligence	Machine or software that can demonstrate behavior indistinguishable from that of the human brain	Automating routine and repetitive tasks and processes; Replacing humans with software-based entities; Improving compliance and decision-making; Delivering focusses services more efficiently and effectively	Deciding when to use professional judgement/rely on software; Progressive de-skilling of the accountancy profession; Managing expectations; Self-learning systems could become more effective than expert professionals

Source: Chua (2013)

Although Chua (2013), in name of Accountancy Futures Academy, have shown an overview of some new technologies, there are a few more that are expected to have a big impact on professional development in accounting. All of them are connected to the internet, which is considered the biggest disruptive technology to business models so far or, in Dimitriu and Matei's (2015, p.666) words, "the starting point of (the) information revolution". Another good example of the internet's impact is described by Sutton (2000, p.2) who remarked: "The single biggest catalyst for change in the way organizations will do business in the future is the Internet." Actually, the internet paved the way for the development of other disruptive technologies, and it developed itself into a concept called the internet of things (IoT), that is a "new technological paradigm that aims to connect anything and anyone at any time and any place, giving rise to innovative new applications and services" (Lu et al., 2018, p.285).

Within the context of internet connected devices generating data, arose Big Data, which is a "term coined to describe the scenario in which a diverse range of data in various formats is currently being produced and captured globally, and the vast amount of data is being generated at very high speed" (Pan et al., 2015, p.13). However, Big Data needs data analytics in order to be useful, or, in other words, data mining, statistical and quantitative methods (Pan et al., 2015). In the same way, financial markets have experienced the spread of cryptocurrency, notably Bitcoin. The technology behind Bitcoin, Blockchain, is also considered a disruptive new technology. "Simplified, a blockchain is a digital platform that stores records of value transactions through a distributed, peer-to-peer network. The records on a blockchain are immutable, which means the ledger is verifiable and auditable" (Farrar, 2018b, p.4).

In order to help the understanding of new technologies, Ehrenhalt's study (Deloitte, 2016) highlights them, separating them into core modernization and exponential tools. As core modernization, one can classify those that extend performance or capabilities through long-established technologies. Those tools that deliver new capabilities are named exponential. For better understanding, see the further considerations below, based on Ehrenhalt (Deloitte, 2016).

Core modernization

- Cloud computing – saving with IT infrastructure, it is the usage of the internet to deliver services.
- Process robotics – automates recurring transaction processing and communication, with more speed, less cost and less risk of errors.
- Visualization – use of images and interactive technology to explore large high-density data sets. Visual metrics are easily understood and can fasten analytical solutions.

Exponentials

- Advanced analytics – combining with big data to see patterns that suggest future opportunities.
- Cognitive computing – simulate human thinking, including machine learning, natural language processing, speech recognition, computer vision and artificial intelligence (AI). Can go through big amounts of data to automate insights and reporting in real time.

- In-memory computing – storing aggregated data in main memory (RAM) to get faster responses. It can become an indispensable tool to make companies able to undergo digital transformation.
- Blockchain – digital distributed ledger, where transactions are verified and securely stored on a network of distributed nodes, without centralization or, in other words, peer-to-peer transactions. Another characteristic of blockchain is the immutability of recorded transactions. Smart contracts, which can be programable to be automatically executed in blockchain are a great possibility. The main obstacles are regulation, control and security risks.

For those interested in the impact of the adoption of new technologies on accounting, an examination of blockchain can be considered mandatory. For Wang and Kogan (2018, p.1), "Blockchain is one of the most disruptive and promising emerging technologies…". The authors continue stating that the big promises are to reduce redundant manual effort, increasing the speed of transaction settlement and preventing financial reporting fraud. This brings the concept of real-time accountancy to the fore. On the other hand, the impeditive of immediate blockchain adoption includes concerns about confidentiality and business secrets.

For a better understanding of how blockchain works, the EVRY whitepaper (Froystad and Holm, 2015, p.11) presents five steps:

> 1 Transaction definition: The "Sender" creates a transaction and transmits it to the network. The transaction message includes details of the Receiver's public address, the value of the transaction, and a cryptographic digital signature that proves the authenticity of the transaction.
> 2 Transaction authentication: The nodes (computers/users) of the network receive the message and authenticate the validity of the message by decrypting the digital signature. The authenticated transaction is placed in a 'pool' of pending transactions.
> 3 Block creation: These pending transactions are put together in an updated version of the ledger, called a block, by one of the nodes in the network. At a specific time interval, the node broadcasts the block to the network for validation

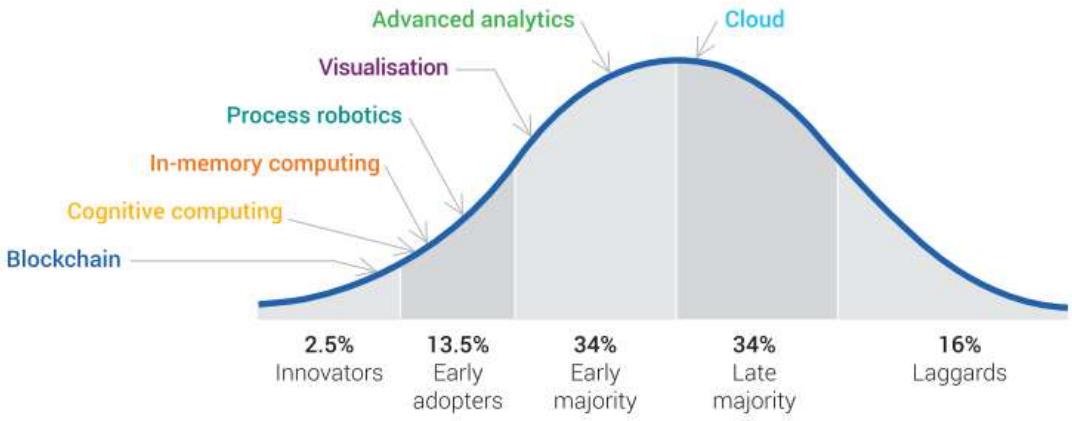
> 4 Block validation: The validator nodes of the network receive the proposed block and work to validate it through an iterative process which requires consensus from a majority of the network.
> 5 Block chaining: If all transactions are validated, the new block is "chained" into the blockchain, and the new current state of the ledger is broadcast to the network. This whole process can be completed in 3-10 seconds.

It is difficult to predict exactly how the implementation of new technologies will impact the accounting profession. However, it is possible to verify some interconnection amongst some of them. "For the business-related IoT prospects, recognizing the importance of opportunities and adjusting their strategies according to the market and users' preferences will improve the performance of organizations" (Lu et al., 2018, p.290). Besides the possible business model change, the IoT generates Big Data. Considering that Big Data is associated with volume, velocity and variety (Janvrin and Watson, 2017) it is probably understandable that it is not possible to foresee any impact of Big Data in isolation, once a lot of unstructured data does not have informational value. Moreover, based on Sledgianowski et al.'s (2017, p.81) definition of business analytics "as the technology and information systems that enable Big Data analysis and reporting in business using different analytic techniques" it is certain to look for future impact from Big Data together with Data analytics. In the Big Data analysis world, it will be necessary "to collect, organize, and mine data for business insights – all in real time" (Drew, 2018, p.1).

The time of implementation of new technologies is unknown. Moreover, it is not linear, with many different factors influencing technology adoption, such as: size, field, high manager profiles, budget and so on. However, to give an understanding of the current moment, we present in figure 6, an adoption curve[5] extracted from Farrar's (2019) 18 months worldwide survey.

[5] For more details, see Diffusion of Innovations, Everett M. Rogers, 1983

Figure 6 – Finance function adoption curve of core modernisation and exponential tools



Source: Farrar's (2019, p.17)

From figure 6, it is noticeable that cloud computing, advanced analytics and visualization are on the top of the curve, in late majority and early majority adopters. The adopters' profiles as described by Rogers (1983, p.248 to 250) are:

> Innovators: Venturesome - Eager to try new ideas...the innovator plays an important role in the diffusion process: that of launching the new idea in the social system by importing the innovation from outside of the system's boundaries.
>
> Early Adopters: Respectable - The role of the early adopter is to decrease uncertainty about a new idea by adopting it, and then conveying a subjective evaluation of the innovation to near-peers by means of interpersonal networks.
>
> Early Majority: Deliberate - The early majority adopt new ideas just before the average member of a social system. Their innovation-decision period is relatively longer than that of the innovator and the early adopter. They follow with deliberate willingness in adopting innovations, but seldom lead.
>
> Late Majority: Skeptical - The late majority adopt new ideas just after the average member of a social system. Adoption may be both an economic necessity and the answer to increasing network pressures. Innovations are approached with a skeptical and

> cautious air, and the late majority do not adopt until most others in their social system have done so.
> Laggards: Traditional - Laggards are the last in a social system to adopt an innovation. They possess almost no opinion leadership. Laggards tend to be frankly suspicious of innovations and change agents. Their traditional orientation slows the innovation-decision process to a crawl, with adoption lagging far behind awareness-knowledge of a new idea.

No matter how one looks at new technologies' implementation, the common sense is the imminent and continuous changes, urging a change of mindset in order to not be considered a laggard adopter.

2.3 Hypothesis development

The usage of new technologies has changed the nature of human relationships, especially those driven by economic transactions (Freeman and Soete, 1997).

To sum up the concept of technological innovation, one can look at Odgers and Nimmervoll (1988, p.128):

> "The overriding message of all the available literature on technological innovation is that it is a global activity, characterized by both an ever increasing rate of change and a significant capacity to impact on business strategy in a fundamental and economically important way."

Considering the current technological evolution, it is perhaps understandable that there have been changes in accountants' roles from ledger keepers focused on cost reduction, to business partners, with adding value to business as the primary objective. The declaration of Zwirtes and Alves (2014, p.40) can shed light on the relationship between technology and accountants' role changes:

> "It can be affirmed that, in some activities, machines and computer systems replaced the human beings. These changes are

> responsible for increased productivity at work and for the dislocation of people to more dynamic activities though, which demand the use of creativity and decision-making power, without concerns with daily repetitive tasks."

Another possible explanation of the relationship between technology and accountants' role changes is to assume that new technologies are instrumental in contributing to specific changes in accounting. With this in mind, see Burns and Scapens's (2000, p.13) explanation: "specific changes in management accounting could be quite revolutionary involving radical change to existing routines and fundamentally challenging the prevailing institutions." To understand this statement, let´s look to Emsley's (2005, p.161) words: "radical innovations represent new management accounting techniques or practices that are characterized by a desire to 'do things differently' (such as introducing customer profitability analysis for the first time) whereas non-radical innovations represent changes to existing management accounting techniques or practices that are characterized by a desire to 'do things better'".

It is possible to link Emsley´s (2005) concept of radical innovations with Farrar's (2018b) list of finance exponential tools (delivering new capabilities to the finance function). One could say that, in Farrar's (2018b) conceptualization, advanced analytics, cognitive computing (artificial intelligence, speech recognition and machine learning), in-memory computing and blockchain are radical technological innovations.

Following the technological innovation, there has been automation. For Pitter (2018), new technologies for accountants are not challenging or threatening, but both. In her vision, "entry-level jobs are being eliminated while accountants with more specialized and higher-level skills are in demand." In line with Pitter (2018), Zwirtes and Alves (2014) found in their research that Information Technology (IT) can offer advantages and disadvantages for accountants. As advantages, they offer greater agility for operations' executions and the generation of new activities. As disadvantages, they can contribute to costs increasing due to the maintenance of the number of employees and greater financial risks.

Revisiting the past technological innovation for accountants, there was the implementation of Enterprise Resource Planning (ERP). "ERP systems appear to be the primary enablers of change in data collection and organizational breadth of management accounting" (Belfo and Trigo, 2013, p.543). This was so profound that ERP was

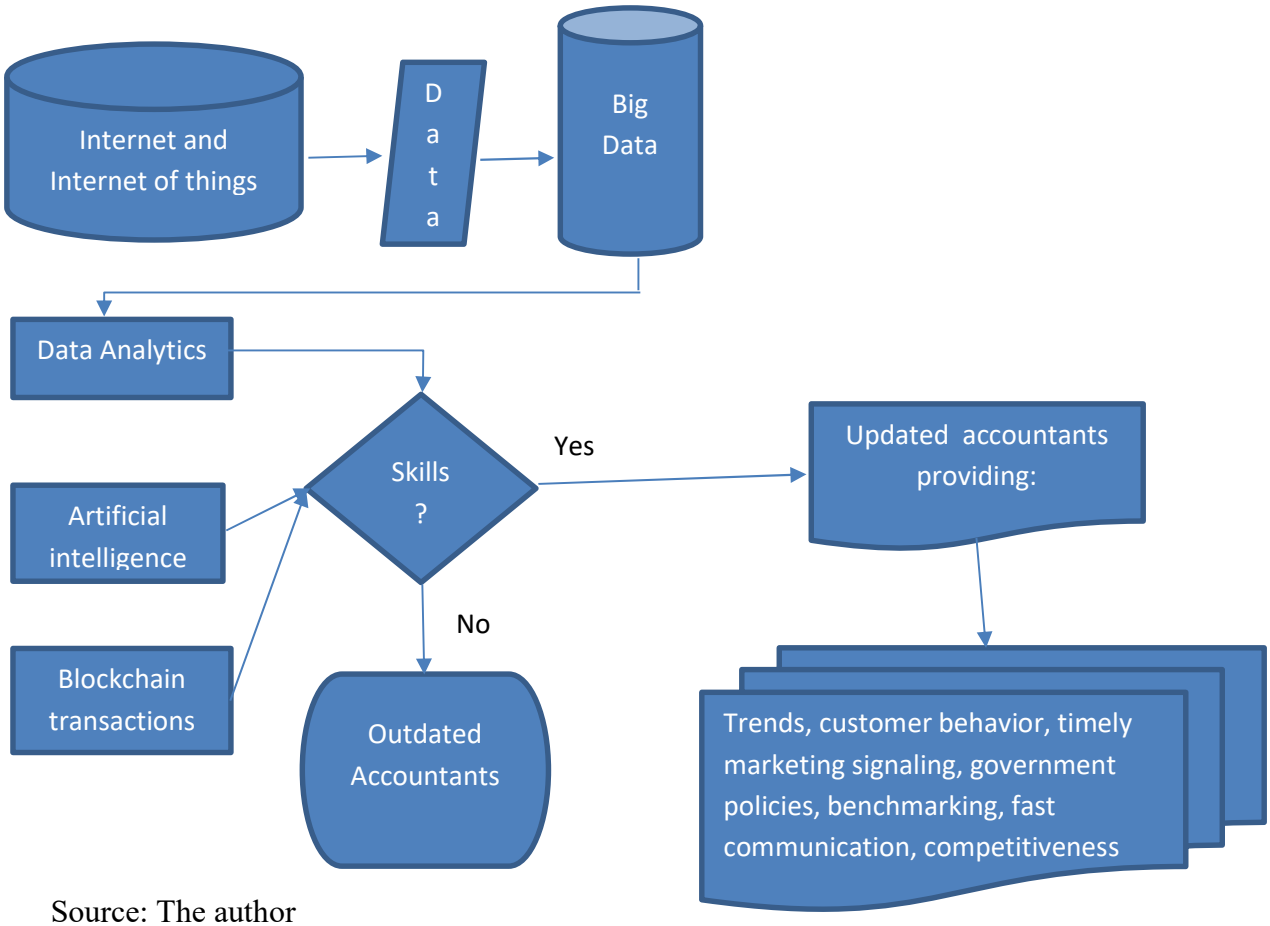
considered the driver of the convergence and integration of financial accounting and management accounting (Caglio, 2003; Taipaleenmäki and Ikäheimo, 2013). ICAEW and DFSA (2017) related that when Enterprise Resource Planning was something new, not adopted by the majority yet, the expectations were to replace human inputs by machines with ERP Systems. However, the observed result was humans being required to manage the systems and for the future it is expected to have human and machines working together. This reinforces Sayed's (2006) findings that accountants felt their skills and knowledge were important to the functioning of ERP.

Despite the common impulse of believing that computers will take all human tasks, Chui and Miremand (2016) state that: "While automation will eliminate very few occupations entirely in the next decade, it will affect portions of almost all jobs to a greater or lesser degree, depending on the type of work they entail." For Simons (2018a, p.5), the "work activities at risk of automation include: data collection, data processing and predictable physical work. Less automatable activities include managing others, applying expertise, stakeholder interactions and unpredictable physical work".

The big challenge for accountants is to keep track of new knowledge, skills and applications. On the opposite side, there is the possibility of becoming an agent of change in this new business model age. Considering these challenges and opportunities, how do accountants see their professional future? Is it possible to see it just as a natural professional evolution, or is it possible that accountants perceive some level of job insecurity? In this study, we will consider job insecurity "as an individual level perception specific to job loss" (Reisel et al., 2010) and verify if the respondents relate job insecurity in the accounting profession to the adoption of new technologies.

Farrar (2019) pointed out that even though technology for some can be seen as a threat, this is not necessarily the only reaction. It is possible to make use of new technologies to improve the performance of financial tasks. The author goes further and suggests that in a technology-based internet society, accountants have to focus on optimization, diversification and transformation. The relationship between new disruptive technologies and accountants' present and future, can be seen likewise as in figure 7:

Figure 7 – New technologies and the accounting profession



Source: The author

The professional pressure to change is on a high level, and National Statistics (2018) claim that one of the main causes of work-related stress is too much pressure or responsibility, while organizational changes at work figure as another factor. In other words, the pressure to adapt and use new technologies, allied with the responsibility of reaching the expectations of stakeholders, may give rise to some sense of threat.

Considering that the pressures are profoundly related to technology it could be of importance for this study to look into the relationship between individuals and technology. Previous studies have developed different models to assess individuals' levels of technology adoption, for example, TAM 1989, TAM2 2000, UTAUT 2003 and UTAUT2 2012 (Pak et al., 2019). It is possible to argue that some individuals are more keen on gadgets, software and apps than others. Looking into how to measure this personal aptitude about technology, we found the Technology Readiness Index as a construct that "can be viewed as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use new

technologies" (Parasuraman, 2000, p. 308). Based on these arguments, I state the following hypotheses.

H1a: There will be a significant positive relationship between accountants' levels of technological readiness and their perceptions of future opportunities within the profession.
H1b: There will be a significant negative relationship between accountants' levels of technological readiness and their perceptions of job insecurity.
H1c: There will be a significant negative relationship between accountants' levels of technological readiness and their perceptions of stress.

A PWC (2017) study about Business Partners found that CFOs and senior finance managers considered that business partners use technology as a competitive advantage, or, in other words, "best performing financial teams are open to continuously changing technological developments, in order to fulfil their role as Business Partner" (p.5). In line with PWC's finding, Oliveira's (2018) study credited information systems and robotic process automation as vital to accountants' role evolution.

> "ERPs and other connected IS, and RPA[6] promote the evolution of the bookkeeping (and administrating) role in two opposite ways. First, towards reduction of low-value activities, in a process often depicted as the "death of the bean counter" within financial accounting, particularly in larger organisations. Second, the continuing need of value-adding accountants for bookkeeping – albeit in smaller number – to configure and maintain software, solve exceptions in human / machine shared processes, and focus on providing business analysis and insights, in a greater engagement with the rest of the organization and introducing a consulting role into the financial accounting domain" (2018, p.137).

[6] IS – Information Systems, RPA – Robotic Process Automation Oliveira (2018)

Linking the ideas that business partners are expected to make use of technological tools (PWC, 2017), business partner (BP) activities (managing others, applying expertise, interactions) are less susceptible to automation (Chui and Miremade 2016), and technology is going to free up time for accountants to focus on business partner activities (Farrar, 2018), it may be expected that if an accountant is already a BP, he/she will perceive technologies as a good thing for his/her job. Hence, it may be argued that business partner roles may be positively correlated with a sense of opportunity related to the future adoption of new technologies within the profession, and negatively correlated with the perception of job insecurity and stress related to the future adoption of new technologies. On this basis, I compose my second set of hypotheses.

H2a: There will be a significant positive relationship between accountants' levels of business involvement and their perceptions of future opportunities within the profession.
H2b: There will be a significant negative relationship between accountants' levels of business involvement and their perceptions of job insecurity.
H2c: There will be a significant negative relationship between accountants' levels of business involvement and their perceptions of stress.

CGMA in 2018 made a Global study about the future form and direction of the finance function, which resulted in four different papers: 1- The changing role and mandate of finance; 2- Changing technology and finance; 3- The changing shape of the finance function; 4- Changing competencies and mindsets. The theme of technology was considered so important that it deserved an exclusive paper, and it is cited in all four of the other papers. As well as underlining the importance of technology, these papers suggested that it was vital to consider the competencies and mindsets of accountants. Some of those interviewed made very insightful quotes. "Finance people need a mindset that enables them to adapt through continuous learning". This mindset was described as "being able to challenge the status quo, adapt, and make an impact when driving change". As we´ve seen before, new technologies were said to push changes in accounting roles, tasks, routines and focus. Thus, the papers called for adaptation within accounting roles.

One key aspect that we may wish to consider is career adaptability, which "refers to a set of psychosocial resources that help individuals successfully manage career-related tasks and transitions" (Rudolph et al., 2017, p.151). Career adaptability is not the same

for all individuals. Savickas and Porfelli (2012, p.662) state that "individuals differ in their willingness or readiness to affect change". The same authors also bring the idea of career adaptability level, stating, "higher levels of adaptation (outcome) are expected for those who are willing (adaptive) and able (adaptability) to perform behaviors that address changing conditions (adapting)" (Savickas and Porfelli 2012, p.662).

Integrating arguments related to the changing financial profession that is pushed by new technologies as presented by Farrar, and the personal level of career adaptability as an individual characteristic as presented by Savickas and Porfelli, the third hypothesis proposes a correlation between the career adaptability level and the sense of opportunity and stress associated with new technologies.

H3a: There will be a significant positive relationship between accountants' levels of career adaptability and their perceptions of opportunities in the profession.

H3b: There will be a significant negative relationship between accountants' levels of career adaptability and their perceptions of job insecurity.

H3c: There will be a significant negative relationship between accountants' levels of career adaptability and their perceptions of stress.

The fourth set of hypotheses examine the relationships between respondents' age and their perceptions of the opportunities and threats associated with new technologies. The origin of this natural link between technology and age can be explained by the fact that those born after 1980 have grown in such a unique technological environment that they are called digital natives (Prensky, 2001a), net generation (Tapscot, 1998 as cited in Bennet et al., 2008) or millennials (Howe and Strauss,2000, 2003 as cited in Kubiato, 2013). A common point of view for all these authors is the fact that "young people of the digital native generation possess sophisticated knowledge of and skills with information technologies" (Bennet et al, 2008, p.777). Prensky shed light on the special environment of Digital natives stating that "they have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones and all the other toys and tools of the digital age". (2001, p.3)

Prensky (2001) went further in drawing the boundary between digital natives and digital immigrants, explaining that while it is possible for digital immigrants to adapt to the digital native environment, they are unable to do so as completely or as naturally as digital natives. Furthering the comparison, the author says that youngster "think and process information fundamentally differently from their predecessors" (Prenksy, 2001a,

p.3). In Prensky's second paper, he brings the idea from social psychologists that "people who grow up in different cultures do not just think about different things, they actually think differently. The environment and culture in which people are raised affects and even determines many of their thought processes" (Prensky, 2001b, p.4).

More directly associated with the present study was Kubiato's study (2013), where it was investigated if there was a difference in the attitudes towards and use of ICT according to one's age group. In his study, the author found that "the Millennial and the X generation are different from each other when it comes to their use of and the attitudes toward ICT and Internet" (p.1272). All of these considerations form the foundation for the fourth set of hypotheses:

H4a: There will be a significant negative relationship between accountants' age and their perceptions of opportunities in the profession.

H4b: There will be a significant positive relationship between accountants' age and their perceptions of job insecurity.

H4c: There will be a significant positive relationship between accountants' age and their perceptions of stress.

3. METHODOLOGY

3.1. Quantitative approach

In order to describe the sampling and to make generalizations about the population from the sample results, the analysis was quantitative, using descriptive and inferential statistics. This study was exploratory and explanatory because exploratory is the most appropriate to understand what is happening, and to develop a more complete understanding of the focal phenomena, while explanatory research seeks to explain the relationship between variables (Saunders et al., 2016). Aiming to access accountants' perceptions about new technologies in terms of threats or opportunities, a pragmatist philosophy was adopted. Mainly because this philosophy "considers theories, concepts, ideas, hypotheses and research findings not in an abstract form, but in terms of the roles they play as instruments of thought and action, and in terms of their practical consequences in specific contexts" (Saunders et al, 2016 p.143). The study had a deductive approach, since its objective was to test hypotheses built on the basis of existing theories.

3.2 Investigation technique

Survey research was identified as suitable for this study, since it "…allows the collection of standardized data from a sizeable population in a highly economical way, allowing easy comparison" (Saunders et al 2016, p.181). The data was collected through questionnaires with demographic data and opinion-based questions.

The sampling was made through Linkedin and Facebook looking for graduate accountants active in the accounting workforce. Since Brazilian accountants normally perform hybrid (financial and managerial accounting) tasks/roles, it is difficult to clearly distinguish between management accountants and financial accountants. Because of that, I chose to focus on accounting roles in general in the study. This choice was based on various studies that consider the integration of financial accounting and management accounting, even though none of them declare the definitive hybridization of accounting profession. An example of this is Caglio's study (2003), wich found that

> "accountants, as a consequence of the introduction of the ERP system, have experienced a phenomenon of 'hybridization', deriving from the enlargement of their set of practices and legitimated competencies. More specifically, one of the positions that benefited most from the introduction of PHS[7] has been the so-called 'chief accountant'. In the past, this particular professional was only in charge of the financial accounting activities, of accounts payable, of treasure management and of tax duties. Nowadays, the activities and responsibilities pertaining to this position are related to the areas of management accounting, reporting, consolidated balance, fixed assets management and inventory management" (p.143)

Taipaleenmäki and Ikäheimo (2013) corroborated Caglio's study, since they found that "the forward-looking FA elements are often intertwined with MA[8], and vice versa, and that convergence in the technical and technological domain appears to precede convergence in the behavioral and organizational domain." (p. 322). Other authors also considered the integration of financial accounting and management accounting convergence. Karlsson et al., (2019) stated that "…in a business partner context,

[7] PHS – ERP sistem in the Caglio's case tudy
[8] FA – Financial accounting; MA – management accounting. Taipaleenmäki and Ikäheimo (2013)

regulative institutional drivers may pull the management accountant in a traditional direction, thus leading to adoption of a hybrid accountant role (p.192)". Weinberger and Angelkort (2011) considered the integration of financial and management accounting a regular topic of discussion, since their research "…was motivated by the increasing integration of financial and management accounting for management control purposes in German-speaking countries (p.175)". Also Dani and Beuren (2014) studied about the increased integration level of the financial and management accounting systems, pushed by the accounting convergence.

3.3 Research stages

The research was conducted in eight stages (figure 8). In the first stage, I received the CIMA sequence of studies about the future of finance and the digital world (Farrar, 2018a, Farrar 2018b; Farrar, 2019) and started to look for related literature through some academic literature sources such as Scopus, Emerald, Springer Link and Research Gate, to define the research question. Next, to build the questionnaire, I looked into pre-validated scales and questionnaires. Next, the questionnaire was pre(pilot)-tested by eight accountants. These accountants did not identify any problems with the survey. After that, I looked through Linkedin connections (profile indicating accountant graduation and professional experience) and Facebook communities of accountants. The invitation to make a Linkedin connection was accepted by approximately 3.500 accountants. I sent personal requests to answer the survey, including a google form link, and received 500 answered questionnaires. However, 11 hade the same e-mail address (for those we kept the last one sent), three had not yet graduated, 11 did not work as an accountant and two were unemployed. This resulted in a valid sample of 473 respondents. Moreover, there was a mistake in the initial survey instrument about technology readiness, which invalidated the answers to one question. So, I made another Google form with only this question and sent another request to those who had already answered the questionnaire, using the e-mail address as a way to link the first and the second questionnaires. As a result of this, this scale had a lower final response rate than the other scales, with a total of 232 valid respondents. Finally, the data was tabulated and analyzed.

Figure 8 – Research stages

Stage	Activity
I	Search and reading related literature
II	Questionnaire construction
III	Questionnaire's pre-test
IV	Search into Linkedin profiles to potential respondents
V	Connection invitation through Linkedin
VI	Sending the message with the survey link
VII	Data tabulation
VIII	Data analysis

Source: The author

3.4 Ethics Protocol

As usual in research involving primary data collection, a key ethical issue is to protect respondents' anonymity. To ensure this, the data collection tools avoided sensitive information such as names, detailed addresses, or any identifiable information, and only collected broad demographic information. Moreover, the respondents could decide not to answer the questionnaire at any time.

3.5 Research Instrument

The questionnaire was based on the Chartered Global Management Accountant (CGMA) questionnaire with adaptations in order to explore the key hypotheses. The final version resulted in 6 sections (see Appendix 1), with an average response time of 15 minutes. Google forms was the platform used to present the questionnaire. The sections' distribution can be seen in figure 9 below.

Figure 9 – Questionnaire composition

Section	Objective
A	Identify the role of the respondent as business partner or bean counter and his/her level of involvement in decision-making
B	Identify the technological readiness level of the respondent
C	Measure the respondent's level of career adaptability and job insecurity
D	Investigate knowledge and usage of new technologies
E	Measure the respondent's perceptions of opportunity and threat about new technologies
F	Explore the respondent's demographics

Source: The author

3.6 Measures

The questionnaire incorporated pre-established/pre-validated scales that were originally developed in English. After being translated to Portuguese by the author and reviewed by the advisor professor who are both Brazilian, it was sent to be back translated by a Brazilian student studying a master's degree in accounting. After that, the co-advisor professor, who is British, reviewed the back translations and found no issues with the phrasing. Figure 10 below demonstrates the source of the pre-established/validated scales used.

Figure 10 – Sources of (pre-established) scales for study variables

Variable	Questions	Source
Business Partner	Section A (question 2)	Fourné, S. P. L., Guessow, D. Schäffer, Utz. (2018). Controller Roles: Scale Development and Validation.*In* Performance Measurement and Management Control: The Relevance of Performance Measurement and Management Control Research. Published online: 21 Aug 2018; 143-190.
Involvement in decision making	Section A (questions 3 and 4)	Adapted from Sathe (1982) cited in Zoni, L., Merchant. Kenneth A. (2007). Controller involvement in management: an empirical study in large Italian corporations. Journal of accounting & Organizational Change. Vol. 3 N.1, 29-43
Technology Readiness Index (TRI)	Section B (question 5)	Based on Parasuraman, A.(2000). Technology Readiness Index (TRI). A Multiple-Item Scale to Measure Readiness to Embrace New Technology. *Journal of Service Research, V.2, N.4*. 307-320
Career adaptability	Section C (question 6)	Adapted from Savickas, M.L., Porfeli, E.J. (2012). Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. *Journal of Vocational Behavior*, 80, 661-673
Job insecurity	Section C (question 7)	Based on Elst, T.V., De Witte, H., De Cuyper, N. (2014). The Job Insecurity Scale: A psychometric evaluation across five European countries. *European Journal of Work and Organizational Psychology*. 23:3, 364-380
Awareness/usage of new technologies	Section D (question 8)	Based on Farrar, M. (2019). Re-inventing finance for a digital world. CGMA
Opportunity	Section E (question 9)	Adapted from Thomas, J.B., Clark, S.M., Gioia, D.A. (1993). Strategic Sense Making and organizational performance: linkages among scanning, interpretation, action and outcomes. *Academy of Management* Journal. Vol 36, n.2, 239-270
Threat	Section E (question 9)	Adapted from Thomas, J.B., Clark, S.M., Gioia, D.A. (1993). Strategic Sense Making and organizational performance: linkages among scanning, interpretation, action and outcomes. *Academy of Management* Journal. Vol 36, n.2, 239-270

Uncertainty and Stress	Section E (questions 10 and 11)	Adapted by Terry, D. J. & Callan, V. J. (1998). Ingroup bias in response to an organizational merger. *Group Dynamics: Theory, Research and Practice, 2,* 2, 67-81.

Source: The author

In terms of scales the questionnaire primarily consisted of likert-style questions, except in section D, which included multiple answers and section F, which included open questions. For better understanding of the study, I present figure 11, which outlines how each variable was measured. It is notable that all scales were kept the same as in the original source.

Figure 11 – Variables' measurement

Variable	Questions	Scales
Business Partner	Section A (question 2) Six propositions	Mean of the responses considering the likert scale of 7 points
Involvement in decision making	Section A (questions 3 and 4) Six propositions, segregated in two questions, the first about operational decision and the second about strategic decision.	Mean of the responses considering the likert scale of 5 points
Technology Readiness Index (TRI)	Section B (question 5) Six propositions	Mean of the responses considering the likert scale of 5 points
Career adaptability	Section C (question 6) 24 propositions	Mean of the responses considering the likert scale of 5 points
Job insecurity	Section C (question 7) Four propositions	Mean of the responses considering the likert scale of 5 points
Awareness/usage of new technologies	Section D (question 8) Investigative question	Identification of usage level and awareness, there was no numerical scale
Opportunity	Section E (question 9) Six first propositions	Mean of the responses considering the likert scale of 7 points
Threat	Section E (question 9) Four last propositions	Mean of the responses considering the likert scale of 7 points
Uncertainty and stress	Section E (questions 10 and 11) Question 10 had two propositions Question 11 one proposition	For question 10, mean of two propositions considering the likert scale of 7 points For question 11, the direct answer of 5 points likert scale
Categorical variables	Section F	For Size (micro, small, medium, big), Gender (female, male), School (post-graduated or not) and role (leadership or not). Dummy variables were used

Source: The author

The reliability of each scale was confirmed through the examination of Cronbach's Alphas for each construct. All of them were higher than .833, thus, acceptable.

Within the Technology Readiness Index, the sub-dimension that best fitted the present study was the Innovativeness dimension which relates to "a tendency to be a technology

pioneer and thought leader" (Parasuraman, 2000, p.311). We thus chose this scale as a proxy for technological readiness when testing the first hypothesis under investigation.

Career adaptability was measured by CAAS, which is an international index, validated in Brazil (for further details see Teixeira et al., 2012).

In their measure of positive gain, Thomas et al. (1993) combined positive-negative gain-loss into a single dimension because they were "operationally indistinguishable and highly correlated" (p.241). This assumption was tested in the data under study, through calculating the Cronbach´s Alpha (.825) and through factor analysis. The result was two factors with items for threat and opportunity failing to load onto the same factor. Considering that, it was decided that the items for threat and opportunity should be treated as two separate variables, rather than as a single scale. I thus calculated the mean for opportunity (Alpha .934) and the mean for threat (Alpha .954).

In order to measure stress, Terry and Callan (1998, p.71) developed a 3-item scale that incorporated aspects of stress, disruption and uncertainty. However, one item had an anchor from 1 to 5, while the first two were from 1 to 7. I ran the correlation matrix and only stress and disruption were significantly correlated. Calculating the Cronbach´s Alpha of stress and disruption the result was .833 and correlation of .714. This way, it was possible to combine these two items into a scale and to calculate the mean of them. The authors originally named the scale as perceived threat, but in this study, differently from the authors, we named this scale as stress, in order to clearly differentiate it from the threat scale.

In order to classify the size of the company, we used SEBRAE's conceptualization which defines the size based on the number of employees in each industry. See figure 12 below.

Figure 12 – Size of companies

Size	Trade and Services	Industry
Micro enterprise	Up to 9 employees	Up to 19 employees
Small Business	10 to 49 employees	20 to 99 employees
Medium size company	50 to 99 employees	100 to 499 employees
Big companies	100 or more employees	500 or more employees

Source: SEBRAE-NA/ Dieese (2013, p.17)

3.7 Data treatment and analysis

The tabulation of data was made in excel, and data treatment and analysis were made in IBM SPSS Statistics. Figure 13 presents the key statistical techniques employed, and their objectives.

Figure 13 – Statistical Techniques

Technique	Objective
Cronbach's Alpha	To measure the reliability or internal consistency of the questionnaire
Anova	To seek for relevant differences in means
Descriptive statistics	To better understand the sample composition and the respondents' profiles
Spearman correlation	To evaluate the degree of correlation between the variables
Kolmogorov-Smirnov and Shapiro-Wilk	To understand if the data residuals conformed to the normality premise
Durbin-Watson	To see if there were autocorrelation issues between the variables
Multiple linear regression	To investigate the relationships between independent variables and dependent variables

Source: The author

The residuals of all linear regressions performed in order to analyze the hypotheses were tested for normality using Kolmogorov-Smirnov and Shapiro-Wilk, and the results indicated that the data was not normal. Hence, we followed Denis' (2019) suggestion and performed transformations of the variables (logarithm and square root). We then conducted the analyses (regressions) with both the original variables and the transformed variables. The normality improved following the transformations and the transformations did not have any effects on the significance tests and model results. We therefore present our analysis with the original data, as recommended by Denis (2019).

> "Data will never be *perfectly* normal or linear, anyway, so slight deviations from normality, etc, are usually not a problem. A safeguard against this approach is to try the given analysis with the original variable, then again with the transformed variable, and observe whether the transformation had any effect on significance tests and model results overall. If it did not, then you are probably safe not performing any transformation." (Denis, 2019, p.31)

4. RESULTS

4.1. DESCRIPTIVE ANALYSIS

4.1.1 Respondents' Profile

I began by examining respondents' profiles in terms of gender, schooling, professional role, age, professional tenure and time in the current company. In terms of gender, around 59% of respondents were male and 41% were female. This is very near to the official statistics regarding Brazilian accountants' gender distribution, which is recorded to be almost 43% women and 57% men (Pasetto, 2018)

Table 1 – Respondents' gender

Gender	Frequency	Percentage (%)
Male	277	58,6
Female	192	40,6
No response	4	0,8
Total	**473**	**100**

Source: Survey data

The schooling of the respondents is presented in Table 2. This shows that the majority of respondents (57,1%) had completed executive education, 29,4% were graduates and 12.9% had received post-graduate qualifications.

Table 2 – Respondents' schooling

Schooling	Frequency	Percentage (%)
Graduation	139	29,4
Executive Education	270	57,1
Post-Graduation	61	12,9
Another	3	0,6
Total	**473**	**100**

Source: Survey data

In terms of roles, 29% of respondents reported that they were chief accountants, 29.2% characterized themselves as staff accountants, and almost the same number of respondents (30%) answered "other". Three percent were managing directors and 1.3% were financial directors/CFOs.

Table 3 – Respondents' role

Role	Frequency	Percentage (%)
Controller	36	7,6
Chief Accountant	137	29,0
Staff accountant	138	29,2
Managing director	14	3,0
Financial director (CFO)	6	1,3
Other	142	30
Total	**473**	**100**

Source: Survey data

In terms of age, professional tenure and time in the current company, the results are presented in table 4. The mean of respondents' age was approximately 36 years old. The youngest respondent was 20, the oldest was 68. The mean of professional tenure was 10 years and the average time spent in the current company was almost 6 years.

Table 4 – Age, professional tenure and time in the current company

Descriptive statistics elements	Age	Tenure	Time
Mean	36,20	10,44	5,69
Standard deviation	9,43	9,28	6,55

Source: Survey data

4.1.2 Variables descriptive statistics

4.1.2.1 Technological readiness

Considering that the main focus of this study was on the adoption of new technologies, looking at item-level responses, the highest mean was in response to the proposition that: "you enjoy the challenge of figuring out high-tech gadgets" (mean= 4.08), and the lowest mean was in relation to the proposition "in general you are among the first in your circle of friends to acquire new technology when it appears" (3.18). However, it's important to note that all responses were higher than the median of the scale (3), and the overall mean for this scale was high (3.75). This way, it is possible to conclude that, in general, respondents perceived that they had high levels of technology readiness.

Table 5 – Technology readiness

	Mean	Std.Dev
Other people come to you for advice on new technologies	3.63	1.18
In general, you are among the first in your circle of friends to acquire new technology when it appears	3.18	1.27
You can usually figure out new high-tech products and services without help from others	3.93	1.09
You keep up with the latest technological developments in your areas of interest	3.89	1.07
You enjoy the challenge of figuring out high-tech gadgets	4.08	1.11
You find you have fewer problems than other people in making technology work for you	3.76	1.26
Technology Readiness	**3.75**	**0.93**

Source: Survey data

4.1.2.2 Career adaptability

As shown in Table 6, respondents perceived that they had high levels of career adaptability, since the mean for each sub-dimension and the overall scale was above 4.25. Lower item-level responses were found for the proposition (I have developed the ability of) “doing what´s right for me” (4.02), while the highest was found for the proposition (I have developed the ability of) “taking responsibility for my actions” (4.57), which are both in the control sub-dimension. This analysis leads us to conclude that the Brazilian accountants surveyed perceived that they had high levels of career adaptability.

Table 6 – Career adaptability

	Mean	Std.Dev
CONCERN	**4.30**	**0.64**
Thinking about what my future will be like	4.16	0.79
Realizing that today´s choices shape my future	4.52	0.68
Preparing for the future	4.22	0.82
Becoming aware of the educational career choices that I must make	4.33	0.77
Planning how to achieve my goals	4.17	0.83
Becoming concerned about my career	4.36	0.81
CONTROL	**4.25**	**0.62**
Keeping upbeat	4.15	0.88
Making decisions by myself	4.22	0.81

Taking responsibility for my actions	4.57	0.68
Sticking up for my beliefs	4.35	0.75
Counting on myself	4.22	0.79
Doing what´s right for me	4.02	0.91
CURIOSITY	**4.25**	**0.65**
Exploring my surroundings	4.15	0,78
Looking for opportunities to grow as a person	4.38	0.75
Investigating options before making a choice	4.18	0.80
Observing different ways of doing things	4.21	0.79
Probing deeply into questions I have	4.23	0.76
Becoming curious about new opportunities	4.32	0.77
CONFIDENCE	**4.43**	**0.62**
Performing tasks efficiently	4.38	0.70
Taking care to do things well	4.48	0.68
Learning new skills	4.32	0.76
Working up to my ability	4.52	0,71
Overcoming obstacles	4.14	0.71
Solving problems	4.43	0.71
CAREER ADAPTABILITY	**4.30**	**0.57**

Source: Survey data

4.1.2.3 Job Insecurity

Considering the descriptive statistics related to job insecurity it is possible to consider that the respondents were slightly more confident than concerned about their jobs, since the mean was 2.22, thus lower than the scale median of 3 (table 7).

Table 7 – Job insecurity

	Mean	Std.Dev
Chances are, I will soon lose my job	2.09	1.18
I am not sure I can keep my job	2.28	1.28
I feel insecure about the future of my job	2.31	1.30
I think I might lose my job in the near future	2.20	1.29
Job Insecurity	**2.22**	**1.11**

Source: Survey data

4.1.2.4 Business partner, operational decision and strategic decision

The mean responses of each proposition of business partner were near 3, indicating that, on average, respondents engaged in the activity around every 3 months (please see

table 8). An exception was the proposition "I join steering committees to present financial implications of strategic options", which had the lowest mean of 2.48, indicating that respondents engaged in this activity less frequently. The mean of the overall scale/variable was 2.94, lower than the median of the scale, which can be interpreted as showing that respondents were not frequently/fully engaged in key business partner functions.

Table 8 – Business partner

	Mean	Std.Dev
I work on scenario analyses to support strategic planning purposes	3.22	2.04
I discuss future business perspectives with Management	3.02	1.91
I conduct sensitivity analyses on key drivers of business performance	2.75	1.85
I pro-actively explain to management how changes in non-financial performance measures affect profitability	2.94	1.86
I discuss strategic issues with senior Management	3.22	1.98
I join steering committees to present financial implications of strategic options	2.48	1.73
Business partner	**2.94**	**1.58**

Source: Survey data

As can be seen in table 9, on average, respondents reported that they were sometimes (to almost always) involved in operational decisions, since the mean was 3.19. Conversely, respondents reported that they were relatively rarely involved in strategic decisions, with a mean of 2.75 indicating that they were 'almost never' or only 'sometimes' involved in these types of decisions (see table 10).

Table 9 – Operational decision-making

	Mean	Std.Dev
Present information and analysis (e.g. storage management; cost controlling; purchase/sell report of products/services; sales forecasts; etc)	3.39	1.30
Recommend action that should be taken (e.g. employees controlling and inspection; product storage; price decision, discount; etc)	3.19	1.29
Challenge plans and actions of operating executives (e.g. storage policy; hiring employees; recognition and control of costs in products / services, etc)	2.99	1.31
Operational Decision-making	**3.19**	**1.16**

Source: Survey data

Table 10 – Strategic decision-making

	Mean	Std.Dev
Present information and analysis (e.g. risk analysis and forecasts; investment evaluation; adoption and / or development of systems; strategic planning; etc)	2.82	1.32
Recommend action that should be taken (e.g procurement decisions; expansion of sales mix, etc.)	2,67	1.30
Challenge plans and actions of operating executives (e.g. systems implementation; criteria for evaluating the performance of managers; certifications; etc)	2.75	1.31
Strategic Decision-making	**2.75**	**1.19**

Source: Survey data

Broadly speaking, the results show that the respondents were sometimes involved in operational decisions but were less involved in strategic decisions. On average, respondents reported that they undertook business partner tasks approximately every three months (mean of 2.94). This result can be interpreted as showing that Brazilian accountants may be more likely to be considered as bean-counters than business partners.

4.1.2.5 Opportunity and threat

The main conclusion about the descriptive statistics is that the respondents were very optimistic about new technologies adoption, since the 'opportunity' scale had a mean of 5.97 - near the top of the 7-point scale, with "perceive that benefits will come from the adoption of new technologies" having a mean of 6.29 (table 11). On the other hand, threat had a mean of 2.69 (table12), indicating that, on average, few respondents felt threatened by the (potential) introduction of new technologies in the future.

Table 11 – Opportunity

	Mean	Std.Dev
Perceive that benefits will come from the adoption of new technologies?	6.29	1.27
Fell the future will be better because of the adoption of new technologies?	5.95	1.38
Label the adoption of new technologies as a potential gain?	5.98	1.37
See the adoption of new technologies as having positive implications for the future?	6.05	1.35
Feel that there is a high probability of gaining a great deal?	5.61	1.54
Label the adoption of new technologies as something positive?	5.96	1.34
Opportunity	**5.97**	**1.19**

Source: Survey data

Table 12 – Threat

	Mean	Std.Dev
Label the adoption of new technologies as something negative?	2.65	2.05
Feel that there is a high probability of losing a great deal?	2.86	2.09
Label the adoption of new technologies as a potential loss?	2.64	2.02
See the adoption of new technologies as having negative implications for the future?	2.61	2.03
Threat	**2.69**	**1.92**

Source: Survey data

4.1.2.6 Stress

Stress is a measure of stress and disruption, and this study found the respondents near the middle of the scale, since the mean was 3.28, or, in other words, the respondents didn't feel too much stress and disruption from the prospect of the (potential) adoption of new technologies (please see table 13).

Table 13 – Stress

	Mean	Std.Dev
Evaluate the new technologies on the following criteria: stressfulness	3.24	1.76
Evaluate the new technologies on the following criteria: disruptive	3.32	1.84
Stress	**3.28**	**1.67**

Source: Survey data

4.2 INFERENTIAL ANALYSIS

In order to examine the relationship between the variables, we performed correlation tests and also multilinear regression. I will begin by examining the correlations, before presenting tests of each of the research hypotheses.

4.2.1 Correlation analysis

In order to determine which correlation test best fit to the data under study, Kolmogorov-Smirnov's and Shappiro-wilk's test were applied. Considering that the variables were not normal, the Spearman correlation was performed.

We found a strong positive correlation between business partner and operational decision-making (.637, $p<0.01$), which demonstrates that involvement in business partner tasks was positively associated with the frequency of operational decisions, contradicting

the expectation that the higher the business level, the lower the involvement in decisions at an operational level. In terms of business partner and strategic decision-making, we found the expected strong positive correlation (.701, $p<0.01$), indicating that the higher the business partner level, the higher the involvement in strategic decisions.

In terms of technology readiness, we expected to find a positive correlation with opportunity (.301, $p<0.01$) and we did, but surprisingly it was not strong, but only moderate. We also found the expected negative, although weak, correlation with job insecurity (-.178, $p<0.01$) and uncertainty (-.152, $p<0.05$), but we did not find the expected significant negative correlation with threat (-.037, $p=0.572$) and with stress (-.040, $p=0.543$).

Career adaptability was found to be positively correlated with opportunity (.323, $p<0.01$) and negatively correlated with uncertainty (-.153, $p<0.01$), as predicted. However, we also expected significant correlations, that were not observed, between career adaptability and threat (-.075, $p=0.105$) and career adaptability and stress (-.014, $p=0.769$).

We expected that job insecurity would be significantly negatively correlated with business partner and strategic decision-making. However, these relationships were found to be non-significant (-.040, p=0,388 and -.065, $p=0.155$ respectively). Somewhat surprisingly, we found a negative correlation between job insecurity and operational decision-making (-.120, $p<0.01$), signaling that the more involved respondents were in operational decision-making, the lower their sense of job insecurity. The expected significant negative correlations between job insecurity and career adaptability (-.192, $p<0.01$) and opportunity (-.161, $p<0.01$) were found, or in other words, the greater respondents' perceptions of career adaptability and opportunity, the lower their sense of job insecurity. Finally, threat (.254, $p<0.01$), stress (.099, $p<0.05$) and uncertainty (.229, $p<0.01$) were positively correlated with respondents' perceptions of job insecurity, as expected.

In the words of Mitzner et al. (2011, p.10), "stereotypes suggest that older adults are unable, unwilling, or afraid to use technology." As such, one could expect a significant negative correlation between age and technology readiness. Conversely, Mitzner et al. found that older adults had more positive than negative attitudes about the technology they use. In our sample, we found a positive, but weak, correlation between age and

technology readiness (.153, p<0.05), suggesting that the cited stereotypes deserve to be challenged in further studies.

Figure 14 – Spearman correlation

	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Business partner	(.913)												
2.Operationl Decision	,637**	(.842)											
3.Strategic Decision	,701**	,751**	(.897)										
4.Technology Readiness	,297**	,339**	,379**	(.887)									
5.Career Adaptation	,177**	,191**	,224**	,331**	(.965)								
6.Job Insecurity	-0,040	-,120**	-0,065	-,178**	-,192**	(.902)							
7.Opportunity	,217**	,198**	,210**	,301**	,323**	-,161**	(.936)						
8.Threat	0,028	-0,044	0,020	-0,037	-0,075	,254**	-,170**	(.954)					
9. Stress	0,023	0,022	0,029	-0,040	-0,014	,099*	-0,046	,251**	(.833)				
10.Uncertainty	-0,088	-0,075	-0,041	-,152*	-,153**	,229**	-,299**	,327**	,327**	1,000			
11.Tenure	,203**	,153**	,195**	,199**	0,027	-0,005	-0,011	-0,015	,103*	0,006	1,000		
12.Time	0,073	0,075	0,069	0,102	-0,033	-0,089	0,079	0,000	0,081	-0,035	,437**	1,000	
13.Age	,113*	0,067	,112*	,153*	-0,032	0,076	-0,025	0,006	,106*	-0,021	,767**	,432**	1,000

**Significative correlation to 1% level (p-value < 0.01) and * significative correlation to 5% level (p-value < 0.05). In brackets, the Cronbah's Alpha

Source: Survey data

4.2.2 Analysis and discussion of research hypotheses

4.2.2.1 Technology knowledge and usage level

Working with AICPA and CIMA in 2019, Farrar published the result of a global research involving more than 5,500 finance professionals from over 2,000 organizations in over 150 countries. The objective of this research was "to understand the future needs of businesses and employers globally in a digital world; to gain insight into the finance function in a digital world; to understand how new competencies are emerging in a digital world; to signpost the competency implications for finance professionals". (Farrar, 2019, p.1). In the present study, our examination of Brazilian accountants' knowledge and usage level of new technologies was based on Farrar's research. In table 14 the results of our analysis are shown, with Brazilian accountants' knowledge (first question) being above 56%, and their sense that new technologies were critical to transform organizations (sixth question) being above 29%. However, the usage level (third question) was very low, especially for the technologies considered to be exponential tools, which include advanced analytics, cognitive computing, in-memory computing and blockchain.

Comparing the respondents' usage level of new technologies with Farrar's survey (2019), Brazilians were found to be less likely to use the new technologies than respondents in Farrar's study, even though the CIMA survey was conducted in the first

semester of 2018, thus, 1,5 year before our study. In terms of Brazilian respondents' intentions to invest in these new technologies in the mid-term, they showed (on average) a larger desire than their counterparts in Farrar's study to invest in these tools, but this could be due to their small current usage levels.

Table 14 – Brazilian results of core modernisation and exponential tools impacting the finance function

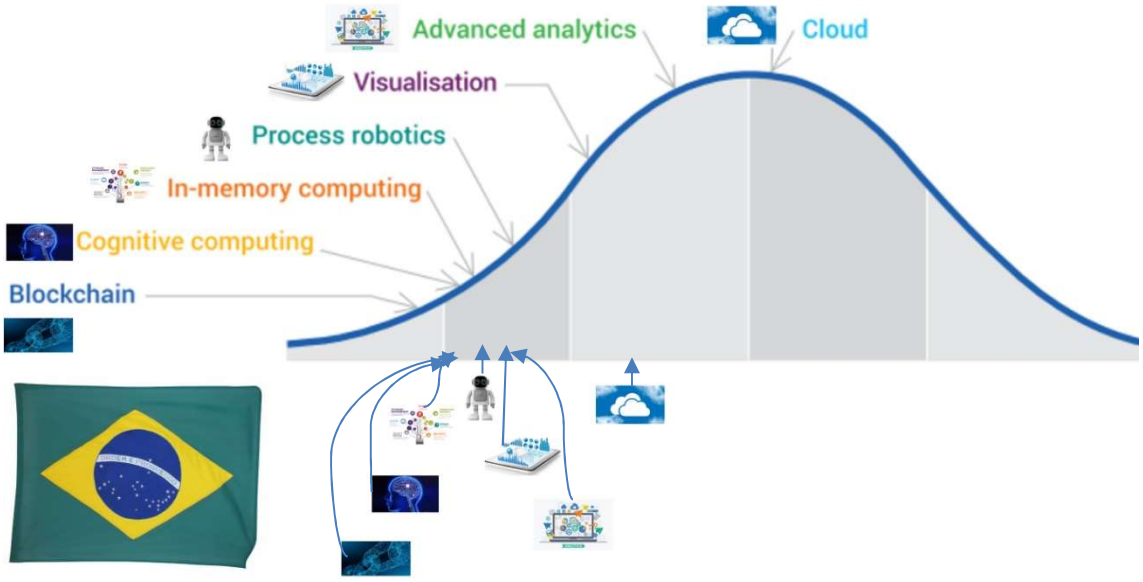
	Cloud	Process robotics	Visualization	Advanced analytics	Cognitive computing	In-memory computing	Blockchain
1- Are you aware of?	65%	63%	64%	57%	62%	59%	62%
2-Do you understand in depth	11%	4%	6%	5%	1%	1%	1%
3-Does your finance team use now?	27%	11%	12%	13%	3%	4%	3%
4-Do finance teams of organisations in your industry use now?	20%	10%	10%	11%	6%	5%	4%
5-Does your finance team plan to invest in next 3-5 years	7%	10%	8%	9%	9%	8%	9%
6-Will be critical in helping transform your organisation	29%	33%	30%	36%	36%	36%	33%

Source: Survey data

Deepening the usage level analysis, we combined the adoption curve presented by Farrar (2019, p.17) and input the results of the present survey in the bottom of figure 15 below. The first area is of innovators (2.5%), followed by early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%). For cloud computing, Advanced analytics and Visualization, the results of our research present Brazil a stage behind in terms of adoption, while for Process robotics, In-memory computing and Cognitive computing Brazil is in the same pace, or, in other words, in the 'early adopters' stage. However, concerning blockchain, this research shows Brazil is at the beginning of early

adopters (3%) while Farrar's study puts worldwide respondents in the 'innovators' area. Of course, it should be noted that this could be caused by the time lapse between the studies.

Figure 15 – Finance function adoption curve of core modernisation and exponential tools



Source: Adapted from Farrar (2019, p.17) and survey data

4.2.2.2 Relationships between technology readiness and the sense of opportunity, job insecurity and stress

Hypothesis 1 predicted that accountants with greater technological readiness would perceive the introduction of new technologies in the accounting profession as less threatening than those with lower expertise.

Hypothesis H1a considered opportunity as the dependent variable and predicted that the higher the technology readiness level, the higher the sense of opportunity. Consistent with hypothesis H1a, we found a significant positive relationship between technology readiness and perceived opportunity (β= 0.278, t=4.394, p<0.001; and a relevant model $F(1,230) = 19.311$; $p<0.001$; $R^2 = 0.077$, Durbin-Watson of 2.122).

Hypothesis H1b considered job insecurity as the dependent variable and stated that the higher the technology readiness, the lower the sense of job insecurity. The findings corroborated this proposition, since there was a significant negative correlation between

technology readiness and job insecurity (β= -0.131, t=-2.009, p=0.046 and a relevant model F(1,230) = 4.037; p=0.046; R^2 = 0.017, Durbin-Watson of 2.058).

Hypothesis H1c considered stress as the dependent variable and predicted that the higher the technology readiness level, the lower the sense of stress. However, the relationship between technology readiness and stress was not found to be significant (β= -0.005, t=-0.68, p=0.946 and the model was not relevant F(1,226) = 0.005; p=0.946 R^2 = 0.000, Durbin-Watson of 1.988). Hypothesis 1c was therefore not supported.

4.2.2.3 Relationships between business partner and the sense of opportunity, job insecurity and stress

Based on the perspective of automation of repetitive tasks, which could be related to operational accounting activities and the lower perspective of automation of non-predictable tasks, such as managing others and interactions with stakeholders (Chui and Miremade, 2016), which can be related to business partner activities, the second set of hypotheses predicted that the business partner role (and associated levels of business involvement) would be related to respondents' perceptions of opportunity, job insecurity and stress.

Hypothesis H2a considered opportunity as the dependent variable and expected that the higher the level of business involvement, the higher the sense of opportunity. Consistent with hypothesis H2a, we found a significant positive relationship between business partner role and perceptions of opportunity (β= 0.232, t=5.172, p<0.001 and a relevant model F(1,471) = 26.752; p<0.001; R^2 = 0.054, Durbin-Watson of 1.942).

Hypothesis H2b stated that the higher the level of business involvement, the lower the perceptions of job insecurity. However, the relationship between business partner and job insecurity was not found to be significant (β= -0.046, t=-0.998, p=0.319) with no relevant model (F(1,471) = 0.996; p=0.319; R^2 = 0.002, Durbin-Watson of 1.909). Therefore, we did not find support for H2b. Likewise, H2c hypothesis predicted that the higher the level of business involvement, the lower the perception of stress. Again we did not find that the involvement in a business partner role was significantly positively associated with stress (β= 0.026, t=0.567, p=0.571 with no relevant model (F(1,463) = 0.322; p=0.571; R^2 = 0.001, Durbin-Watson of 1.947). Thus, hypothesis 2c was not supported by our findings.

4.2.2.4 Relationships between career adaptability and the sense of opportunity, job insecurity and stress

Taking into account that the introduction of new technologies may bring profound changes in accounting procedures (notably in exponential technologies) it is possible to imagine that individuals' abilities to cope with tasks and transitions in their career may be positively related to their sense of threat or opportunity.

This idea led us to hypothesis H3a that accountants with higher career adaptability would have a higher sense of opportunity. The linear regression corroborated this hypothesis, since we found a significant positive correlation, in line with our prediction (β= 0.376, t=8.793, p<0.001 and a relevant model F(1,471) = 77.316; p<0.001; R^2 = 0.141, Durbin-Watson of 2.019).

Hypothesis H3b suggested that the higher the career adaptability, the lower the sense of job insecurity. We find support for hypothesis 3b, with a significant negative relationship between career adaptability and job insecurity (β= -0.146, t=-3.208, p=0.001 and a relevant model F(1,471) = 10.289; p=0.001; R^2 = 0.021, Durbin-Watson of 1.925).

Hypothesis H3c stated that the higher the level of career adaptability, the lower the sense of stress. This prediction was not confirmed, since we did not find a significant negative relationship between career adaptability and stress (β= 0.058, t=1.247, p=0.213 with no relevant model (F(1,463) = 1.556; p=0.213; R^2 = 0.003, Durbin-Watson of 1.947).

4.2.2.5 Relationships between age and the sense of opportunity, job insecurity and stress

Based on the idea of natural interaction between technology and those born after 1980 (Prensky, 2001a, Prensky 2001b, Bennet et al., 2008), hypothesis H4a predicted that younger accountants would have a higher sense of opportunity. However, contradicting this hypothesis, we did not find a significant negative relationship between age and sense of opportunity (β= -0.027 t=-0.580, p=0.562 and no relevant model F(1,466) = 0.336; p=0.562; R^2 = 0.01, Durbin-Watson of 1.978.). Likewise, hypothesis H4b predicted that younger accountants would have a lower sense of job insecurity. This hypothesis was also rejected, since no significant relationship was found (β= 0.044 t=0.953, p=0.341 and no relevant model F(1,466) = 0.908; p=0.341; R^2 = 0.02, Durbin-Watson of 1.878).

Finally, hypothesis H4c predicted that younger accountants would have a lower sense of stress. Our analyses provided support for this prediction, since a significant positive relationship was found between age and stress - that is, the older the respondents were, the more they reported feeling a sense of stress (β= 0.099 t=2.140, p=0.033 and a relevant model F(1,459) = 4.580; p=0.033; R^2 = 0.01, Durbin-Watson of 1.938).

5. CONCLUSION

The main purpose of this study was to examine Brazilian accountants' perceptions of new technologies as threats or opportunities and, at the same time, to investigate the relationships between factors such as technological readiness, business involvement, career adaptation and age, and respondents' perceptions of threats and opportunities. Data were collected from 473 Brazilian accountants who were professionally active in the accounting industry.

Considering the expectation of large changes in accounting driven by the adoption of new technologies, the analysis of core modernisation and exponential tools impacting the finance function found that just a little more than half of Brazilian accountants were aware of these new technologies and less than 20% used them. It can be considered a signal that in the future, Brazilians may have difficulties keeping pace with worldwide accounting practices. In order to avoid this, Brazilian accountants need to develop and improve their usage of technological resources in order to keep up to date with the worldwide development of the profession, and being alert to this point should be a must for accounting education and professionalization. Practitioners need to be prepared to live up to the continuous growing expectations about their performance and, nowadays, due to the digital economy and industry, these expectations are to have an even broader spectrum of activity, adding value to the business through the use of new technologies (Moll and Yigitbasioglu, in press).

Every changing context demands the development of new skills and competencies, and it is intuitive to correlate the development of new technologies with the development of new technological skills. But, not so evident, is the need for practitioners to also develop personal skills, especially those directly connected to the engine of change, in order to avoid feelings of threat and capitalize on the opportunities brought by novel technologies.

The personal skills under study, namely, technological readiness and career adaptability, show similar findings. When looking into regressions, we found that both were positively correlated with the sense of opportunity about the prospect of new technologies adoption within the profession, while they were also both negatively correlated with perceptions of job insecurity. But, we did not find the negative correlations between technology readiness and career adaptability and stress, as predicted.

In this study we also looked for possible correlations between the professional variable "business partner" and the sense of opportunity and threat. Surprisingly, our data analysis only found a significant correlation with the sense of opportunity, in a positive direction, and did not find a correlation between business involvement and a sense of job insecurity nor a sense of stress about the perspective of new technologies implementation in the future.

Considering age, and motivated by the idea that the millennial generation sees technologies as something natural, we expected to find younger accountants with a higher sense of opportunity about the prospect of new technologies in the accounting profession, but our analysis didn't find evidence to corroborate this, nor to corroborate the idea that age could have a positive correlation with perceptions of job insecurity (meaning that older accountants would perceive the new technologies as more threatening to their jobs than younger accountants). Finally, the analysis of the last hypothesis found that age is positively correlated with feelings of stress related to the prospect of the future adoption of new technologies in the accounting profession. Or, in other words, older Brazilian accountants felt more stress about new technologies implementation than younger ones.

A key contribution of this study is that it outlines that even though Brazilian respondents may be optimistic about the adoption of new technologies within accounting, it is necessary to stimulate the development of personal skills such as technological readiness and career adaptability to enhance their perceptions of opportunity and reduce their sense of threat relative to the implementation of new technologies in the accounting profession, that is, the psychological effect of new technologies. The relevance of studying the psychological effects of new technologies comes from the impact of this on job performance and psychological and physical health (Štager, 2017; Elst et al., 2014; Cheng and Chan, 2008). This study is important because past literature has largely focused on the operational/technical challenges of new technologies, but has not paid much attention to behavioral/psychological issues, which was the main point of this study. This way, this study sought to contribute to this gap in the current academic literature.

5.1. Study Limitations

The main limitation of the present study is the fact that we used a technological means (Linkedin) to collect opinions about technology adoption. This way, it is possible we lost the opinion of those who do not engage with technological devices in their daily routine.

Another limitation relates to the sample size. Considering the number of Brazilian accountants of 519,328[9], the sample size of 473 is not enough to produce general findings.

Finally, it is worth mentioning that the social desirability bias could have had an influence on the responses. "Social desirability refers to a tendency to respond to self-reported items in a manner that makes the respondent look good rather than to respond in an accurate and truthful manner" (Holtgraves, 2004, p.161). However, the findings of the same author indicate that respondents tend to consider the questions more carefully when they are concerned about their image, but do not necessarily change them. Although social desirability was not measured in this study, it could be a possible explanation for the high positive answers overall in this study.

5.2. Suggestions for future research

The first suggestion is to broaden the research in order to achieve a larger sample size that allows for generalization. This way, it would be possible to understand the opinion of all Brazilian accountants, rather than only a small sub-sample.

Collecting longitudinal data could demonstrate changes in the Brazilian accountants' perceptions over time and would also allow us to investigate the reasons for changes and the direction of causal effects.

Another suggestion is to make a case study with some of the respondents who are already using blockchain and cognitive computing, since the study's result showed them in the beginning of the scale of early adopters. It would be interesting to try to identify the characteristics of these companies and teams.

[9] Retrieved from http://www3.cfc.org.br/spw/crcs/ConselhoRegionalAtivo.aspx in 01/25/20.

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APENDIX A - Questionnaire

Pesquisa sobre a percepção do contador sobre novas tecnologias

Esta pesquisa busca acessar como os contadores brasileiros percebem o impacto das novas tecnologias no futuro de sua profissão. As perguntas apresentadas devem ser respondidas por contadores formados, com base em suas experiências pessoais, percepções e opiniões, portanto, não há respostas certas ou erradas. Para melhores resultados, pede-se para responder este questionário em particular, tão atentamente quanto possível. Algumas questões podem parecer semelhantes às outras, mas abordam diferentes percepções e aspectos da mesma definição. O tempo de resposta para este questionário é estimado em 15 minutos. O pesquisador afirma que os participantes permanecerão anônimos e as respostas serão tratadas de acordo com critérios éticos e responsáveis, a fim de manter a confidencialidade dos dados, bem como garantir que as informações coletadas sejam utilizadas apenas para os propósitos desta pesquisa acadêmica. Por favor, note que em nenhum momento da pesquisa você precisará digitar seu nome. Caso necessite de algum esclarecimento e / ou informações adicionais, não hesite em entrar em contato com: Leylianne.rabelo@ufpe.br

***Obrigatório**

1) **Endereço de e-mail**

_____

SEÇÃO A

2) Por favor indique com que frequência você geralmente se envolve nas atividades descritas abaixo em sua função atual. 1 = nunca; 2= a cada 6 meses; 3 = a cada 3 meses; 4 = todo mês; 5 = 1 vez 15 dias; 6 = 1 vez semana; 7 = várias vezes por semana

QUESTIONS	SCALE						
	1	**2**	**3**	**4**	**5**	**6**	**7**
1) Eu trabalho em análises de cenário para apoiar o planejamento estratégico							
2) Eu discuto perspectivas de negócios futuros com a gerência							

3) Eu realizo análises de sensibilidade sobre os principais impulsionadores do desempenho dos negócios							
4) Eu explico proativamente à administração como as mudanças nas medidas de desempenho não financeiro afetam a lucratividade							
5) Eu discuto questões estratégicas com o gerente sênior							
6) Eu me reúno aos comitês de direção para apresentar as implicações financeiras das opções estratégicas							

3) Em termos de DECISÕES OPERACIONAIS, nos últimos 12 meses, em que medida você: 1 = nunca; 2= raramente; 3 = às vezes; 4 = frequentemente; 5 = muito frequentemente

QUESTIONS	**SCALE**				
	1	**2**	**3**	**4**	**5**
1) Apresentou informações e análises (ex.gestão de estoques; controle de custos; relatórios de compra/venda de produtos/serviços; previsões de faturamento; etc)					
2) Recomendou ações a serem tomadas (ex. controle e fiscalização de funcionários; armazenamento de produtos; decisões sobre preços; descontos; etc)					
3) Questionou planos e ações de executivos operacionais (ex. política de estocagem; contratação de funcionários; reconhecimento e controle de custos nos produtos/serviços; etc)					

4) Em termos de DECISÕES GERENCIAIS, nos últimos 12 meses, em que medida você: 1 = nunca; 2= raramente; 3 = às vezes; 4 = frequentemente; 5 = muito frequentemente

QUESTIONS	**SCALE**				
	1	**2**	**3**	**4**	**5**

1) Apresentou informações e análises (ex. análises e previsões de riscos; avaliação de investimentos; adoção e/ou desenvolvimento de sistemas; planejamento estratégico; etc)					
2) Recomendou ações a serem tomadas (ex. decisões de aquisições; expansão de mix de vedas; etc)					
3) Questionou planos e ações de executivos operacionais (ex. implementação de sistemas; critérios de avaliação de desempenho dos gestores; cerificações; etc)					

SEÇÃO B

5) Indique seu grau de concordância com as seguintes afirmações 1 = Discordo totalmente; 2 = Discordo em parte; 3 = Não concordo nem discordo; 4 = Concordo em parte; 5 = Concordo totalmente

QUESTIONS	**SCALE**				
	1	**2**	**3**	**4**	**5**
1) As outras pessoas lhe pedem conselhos sobre novas tecnologias					
2) Em geral, você está entre os primeiros de seu grupo de amigos a adquirir uma nova tecnologia logo que ela surge					
3) Você normalmente consegue assimilar produtos e serviços de novas tecnologias sem a ajuda de outras pessoas					
4) Você se mantém atualizado com os últimos desenvolvimentos tecnológicos das suas áreas de interesse					
5) Você gosta do desafio de entender equipamentos de alta tecnologia					
6) Você acha que tem menos problemas do que os outros em fazer a tecnologia trabalhar para vocês					

SEÇÃO C

6) Pessoas diferentes utilizam recursos diferentes para construir suas carreiras / vidas. Ninguém é bom em tudo; cada um procura dar o melhor de si. Por favor leia cada afirmação e indique o quanto você desenvolveu cada uma das habilidades utilizando a escala abaixo. 1 = Muito pouco; 2 = Pouco; 3 = Medianamente; 4 = Bastante; 5 = Plenamente

QUESTIONS	**SCALE**

	1	2	3	4	5
1) Refletir sobre como vai ser o meu futuro					
2) Perceber que meu futuro depende de escolhas de hoje					
3) Preparar-me para o futuro					
4) Tomar consciência das escolhas educacionais e profissionais que tenho de fazer					
5) Planejar como alcançar os meus objetivos					
6) Estar preocupado(a) com a minha carreira					
7) Manter-me otimista					
8) Tomar decisões por mim mesmo(a)					
9) Assumir responsabilidade pelo que faço					
10) Defender as minhas convicções					
11) Agir com autonomia					
12) Fazer o que está certo para mim					
13) Explorar o ambiente à minha volta					
14) Procurar oportunidades para me desenvolver como pessoa					
15) Explorar alternativas antes de fazer uma escolha					
16) Estar atento(a) às diferentes maneiras de fazer as coisas					
17) Analisar de forma aprofundada questões que me dizem respeito					
18) Tornar-me curiosos sobre novas oportunidades					
19) Realizar tarefas de forma eficiente					
20) Ser responsável e fazer as coisas bem					
21) Ser responsável e fazer as coisas bem					
22) Dar sempre o meu melhor					
23) Superar obstáculos					
24) Resolver problemas					

7) **Indique seu grau de concordância com as seguintes afirmações.** 1 = Discordo totalmente; 2 = Discordo em parte; 3 = Não concordo nem discordo; 4 = Concordo em parte; 5 = Concordo totalmente

QUESTIONS	SCALE				
	1	**2**	**3**	**4**	**5**
1) A possibilidade é: eu vou perder meu emprego em breve					
2) Eu não tenho certeza que posso manter meu emprego					
3) Eu sinto-me inseguro em relação ao futuro do meu emprego					
4) Eu penso que posso perder meu emprego em um futuro próximo					

SEÇÃO D

Para referência, por favor observe a definição da Deloitte (Ehrenhalt, 2016) de cada nova tecnologia:

Nuvem – tipo de computação que usa tecnologia escalável e elástica para fornecer serviços pela Internet. Em vez de fazer grandes investimentos antecipadamente, as finanças podem obter a funcionalidade completa de finanças "como um serviço", oferecida através de nuvens públicas, privadas ou híbridas.

Robótica de processos - automatiza o processamento de transações e a comunicação entre vários sistemas de tecnologia. Os robôs executam processos recorrentes como os humanos, mas com menos risco ou erros e fadiga.

Visualização - refere-se ao uso inovador de imagens e tecnologia interativa para explorar conjuntos de dados grandes e de alta densidade. As suítes de visualização complementam as plataformas de business intelligence e analytics, oferecendo gráficos ricos, interatividade e usabilidade em conjunto com as principais experiências do consumidor.

Análises avançadas - a análise faz parte do arsenal de finanças, mas novas técnicas estão ajudando os empresários a lidar com as perguntas desafiadoras com respostas perspicazes. Geralmente, isso significa combinar dados grandes para ver parceiros que sugerem oportunidades futuras.

Computação cognitiva - computação cognitiva e inteligência artificial (IA) simulam o pensamento humano. Essa tecnologia inclui aprendizado de máquina, processamento de linguagem natural, reconhecimento de fala e visão computacional.

Computação em memória - Computação In-memory refere-se ao armazenamento de dados na memória principal para obter tempos de resposta mais rápidos. E como os dados são compactados, os requisitos de armazenamento são reduzidos. O resultado? Velocidade e acesso a quantidades de dados que antes eram impensáveis.

Blockchain - Blockchain é um livro digital distribuído, onde as transações são verificadas e armazenadas com segurança em uma rede de nós distribuídos e conectados, sem uma autoridade central dominante.

8) Quais das seguintes tecnologias...? (Por favor selecione todas as opções aplicáveis)

	Você conhece	**Você entende em profundidade**	**Sua equipe financeira usa agora**	**As equipes de finanças das organizações em seu setor usam agora**	**Sua equipe financeira planeja investir nos próximos 3 a 5 anos**	**Será fundamental para ajudar a transformar sua organização**
Nuvem						
Robótica de processos						
Visualização						
Análises Avançadas						
Computação Cognitiva						
Computação In-Memory						
Blockchain						
Não sabe						

SEÇÃO E

9) Considerando a adoção de novas tecnologias, até que ponto você... 1 = pequena extensão – 7 = grande extensão

QUESTIONS	**SCALE**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
1) Percebe que a adoção de novas tecnologias trará benefícios?							
2) Sente que o futuro será melhor por causa da adoção de novas tecnologias?							
3) Rotula a adoção de novas tecnologias como um ganho potencial?							
4) Vê a adoção de novas tecnologias como tendo implicações positivas para o futuro?							
5) Sente que há uma grande probabilidade de ganhar muito?							

6) Rotula a adoção de novas tecnologias como algo positivo?							
7) Rotula a adoção de novas tecnologias como algo negativo?							
8) Sente que há uma grande probabilidade de uma grande perda?							
9) Rotula a adoção de novas tecnologias como uma perda potencial?							
10) Vê a adoção de novas tecnologias como tendo impactos negativos para o futuro?							

10) Você sente um certo nível de incerteza em relação à adoção de novas tecnologias?

QUESTIONS	**SCALE**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Estresse (1= nada estressante a 7 = extremamente estressante)							
Disruptivo (1= nada perturbador a 7 = extremamente perturbador)							

11) Você sente um certo nível de incerteza em relação à adoção de novas tecnologias?

1 = não, definitivamente não to 5 = sim, definitivamente

QUESTIONS	**SCALE**				
Não, definitivamente não	**1**	**2**	**3**	**4**	**5**
Sim, definitivamente					

SEÇÃO F

12) Em que setor você trabalha?

( ) Bens Industriais
( ) Construção e Transporte
( ) Consumo Cíclico (eletrodomésticos, calçados, vestuário, etc)
( ) Consumo não Cíclico (alimentos, medicamentos, açúcar e álcool, etc)
( ) Financeiro e Outros
( ) Materiais Básicos
( ) Petróleo, Gás e Biocombustíves
( ) Tecnologia da Informação

( ) Telecomunicações
( ) Utilidade Pública
( ) Servidor Público

13) Quantos empregados a sua organização possui?_____

14) Em que estado você trabalha? _____

15) Você é do sexo masculino ou feminino?

( ) Feminino ( ) Masculino

16) Qual é a sua idade? _____

17) Há quanto tempo você é contador? _____

18) Há quanto tempo você está nessa organização? _____

19) Qual é o seu maior grau de escolaridade?

( ) Primario
( ) Secundário
( ) Graduação
( ) Especialização
( ) Mestrado / Doutorado
( ) Outra

20) Qual é a sua posição atual na empresa?

( ) Controller

( ) Contador(a)

( ) Funcionário(a) do setor Contábil

( ) Diretor(a) administrativo(a)

( ) Diretor(a) financeiro(a)

( ) Outra