Accounting Professionals and Digital Maturity: insight from the reflections of digital transformation

Profissionais Contábeis e Maturidade Digital: insights sobre os reflexos da transformação digital

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ABSTRACT
The digital transformation has introduced new challenges and significant changes for society, intensified in this time of (post) pandemic (COVID-19). Among these challenges, the process of learning new technology by professionals, known as digital maturity, has taken on a critical role. It is a fact that digital maturity and digital transformation are not the same thing, but are intimately connected, as both are essential in the current business context.
Despite the relevance of the matter, state of the art focuses, mainly, on building models to evaluate the digital maturity of organizations, reducing the prospect of impacts on the professionals. The goal of this research seeks firstly to evaluate studies on digital technology and their impacts on accounting. For this, bibliographical research was carried out based on *Scopus and Science Direct* examining the relevant publications on digital technology and accounting. Next, we analyzed the results found on the research conducted with accounting postgraduate students in order to understand their level of digital maturity regarding the technologies in evidence in the current market. The analyses revealed that, despite the impact, accounting professionals are still quite unaware of or have limited knowledge about these technologies and consequently the reflexes on their profession.

Keywords: Digital Maturity, Digital Transformation, Accounting Profession

RESUMO
A transformação digital vem introduzindo novos desafios e mudanças marcantes a sociedade, intensificados com momento de (pós) pandemia (COVID-19). Entre esses desafios, o processo de aprendizado de tecnologias pelos profissionais, conhecido como maturidade digital, assumiu um papel

crítico. É fato que maturidade digital e transformação digital não são a mesma coisa, mas estão intimamente conectadas, afinal, ambas são imprescindíveis no atual contexto empresarial. Apesar da relevância da temática, o estado da arte se concentra, principalmente, na construção de modelos para avaliar a maturidade digital das organizações, reduzindo a perspectiva dos impactos aos profissionais. O objetivo da pesquisa busca primeiramente avaliar os estudos sobre as tecnologias digitais e seus impactos na contabilidade. Para tal foi realizada uma pesquisa bibliográfica na base *Scopus e Science Direct* contemplando as publicações relevantes sobre a tecnologias digitais e contabilidade. Em seguida, analisaram-se os resultados encontrados da pesquisa realizada com alunos de pós-graduação na área contábil a fim de entender o nível de maturidade digital sobre as tecnologias em evidência no mercado atual. Estas análises revelaram que, apesar do impacto, os profissionais contábeis ainda desconhecem ou têm baixo conhecimento sobre essas tecnologias e consequentemente os reflexos à sua profissão.

Palavras-Chaves: Maturidade Digital, Transformação Digital, Profissionais da Contabilidade

1 INTRODUCTION

Since digital transformation (DT) has become a matter of survival for companies, reaching digital maturity has become an imminent issue for professionals. This urgency to adapt is mainly known by the paradigm of "digital unemployment": in that digital transformation in organizations may result in the replacement of professionals by automation of activities. The effects of robotization on the labor market can generate a reduction in employment and salaries, especially in relation to routine activities, which are characterized by manual and cognitive work with average qualifications, such as accounting, administrative work, repetitive production and monitoring work (Acemoglu et Restrepo, 2017). However, this paradigm that digital transformation leads to the mass elimination of professions should be treated with caution. Analyzing the impacts of technology on professions is to neglect that many professionals have high level occupations and that the performance of such tasks is still beyond the capacity of machines to resolve (Chui et al., 2015; Arntz et al, 2017). The impact of digital transformation on the labor market, and the professionals working in this market will be what determine its effects.

It is worth noting that although there are several academic studies on digital maturity in the literature, these are predominantly restricted to organizational models and stages (Berghaus, Sabine and Back, 2016; Schumacher, Erol and Sihn, 2016; Colli *et al.*, 2018; Issa *et al.*, 2018; Zapata, Berrah and Tabourot, 2020); specializing on types of companies/organizations (Ulas, 2019; Vial, 2019; Zapata, Berrah and Tabourot, 2020; Costa and Gouveia, 2021); aimed at the application of a new digital technology (Nygaard, Colli and Wæhrens, 2020; Ferrari *et al.*, 2021).

The literature focusing on the digital maturity of professionals is still limited, recent and with a different approach: seeking to identify behavioral traits and skills, such as initiative and leadership, that influence the digital learning process (Diller, Asen and Späth, 2020); highlighting how the skills and needs of professionals can vary depending on technologies and job sectors (Hartmann and Bovenschulte, 2013); providing professionals' perceptions about the advances in robotization (Bhargava, Bester and

Bolton, 2020); and perceptions about technical and behavioural skills required by the digital labour market (Agostino, 2019; S. Fareria *et al.*, 2020; Xavier, L. M.; Camarro, W. B. W. H.; Rodrigues, 2020). Thus, there are still many gaps in academic research on the digital maturity of professionals.

Understanding emerging digital technologies and their impacts on professionals' routines should be the starting point for understanding digital maturity. Professionals should be aware of the requirement to develop new skills and good practices to effectively manage the implementation and use of technology in organizations (Moll and Yigitbasioglu, 2019).

The advent of digital technology must transform working practices into a wider range of jobs and, consequently, the basic requirements for various professions are being shaped, ranging from a basic knowledge of technologies up to the most advanced know-how, such as analysis and programming (Berger and Benedikt Frey, 2016).

The urgency to develop the digital maturity of the accounting profession has been an intention for a few decades. Briefly, in the 1980s, *ERP* systems emerged, which were software responsible for the integration of all the operations of an institution, registering, instantly, from the flux in inventory to the consolidation of the financial statements. In the1990s, the impact of technology was even more evident, as the evolution of software and the improvement n the Internet made it possible to process data in real time. As such, it was from the years 2000, with the *Industry 4.0*. also known as the Fourth Industrial Revolution, that the automation intensified and the exchange of data within the production stages and business models by means of digital technology truly began. Innovation, efficiency, and customization were the key words to define the concept of Industry 4.0 Schwab (2008) characterizing this moment by a ubiquitous and mobile internet, by powerful, smaller and cheaper sensors, and by Artificial Intelligence (AI) used by machines to learn. The impact of the exponential technological advance became more noticeable within what is known as nanotechnologies, the Internet of Things (IOT), robots, artificial intelligence, biotechnology, energy storage systems and quantum computing, to name but a few.

The accounting area, as a fundamental part in the management of organizations, has suffered the effects of these technological innovations in their activities and requires professionals to immerse themselves in a rich process of adaptation and to be up to date in the use of digital tools. However, it is essential to recognize that the process of digital maturity caused by technology is a dynamic and continuous process.

Given the above, analyzing digital transformation from the perspective of the digital maturity of professionals has become increasingly necessary and strategic. Thus, we formulate the research question of the article as follows: *what is the digital maturity of accounting professionals in Brazil with regard to digital technology?"*. In this present study, we developed exploratory research with professionals to evaluate the knowledge and application of digital technology in their jobs. The objective was to identify the level of knowledge as per occupation, that is, to identify the digital maturity of accounting

professionals in the current scenario.

This article is structured as follows: first, a bibliographic review of the available digital technology and their impact on the activities of accounting professionals. Next, we present the results of the survey to accounting professionals on the knowledge and applications of digital technology.

2 DIGITAL TECHNOLOGY IN ACCOUNTING

This section reviews the relevant accounting literature on digital technology that currently affect the activities performed by professionals in this area. There are several innovations today, ranging from simple automation of processes to machine learning. We will focus on nine types of digital technology: *Robotic Process Automation* (RPA), *Artificial Intelligence* (IA), *Blockchain, Business Intelligence* (BI), *IoT – Internet of Things, Big Data, Application Program Interface, Cloud Systems* and *ChatBot´s* and present their relevance and impacts as per these studies.

For analysis, *Scopus and Science Direct* databases were used with individualized research for each digital technology together with the keywords *accounting* and *accountant*. The search was directed at the titles, keywords, and summaries of the scientific articles.

2.1 RPA

RPA is an acronym for "Robotic Process Automation" and was widely adopted for Accounting purposes to automate well-defined and repetitive tasks. Basically, it is a relatively new technology that comprises software agents called 'bots' that mimic the manual path taken by a human being through a variety of computer applications when performing certain tasks in a business process (Syed *et al.*, 2020). The RPA can be found at the intersection of repetitive task automation and digital task performance. The most suitable processes for RPA are based on rules, repetitions, which do not require frequent changes and are, mostly, free of exceptions (Deloitte, 2017).

According to Gartner's research (2020) it is estimated that global revenue in the RPA software market is expected to reach the US$ 1.89 billion mark by 2021, an increase of 19.5% over 2020, and with the prospect of continuing growth in the double digits until 2024. This exponential growth of the RPA product market stems from the perception of the impacts of these automations on the optimization of the quality, speed and productivity of processes, important gains for organizations seeking cost reductions and remaining competitive in the market. Consequently, accounting professionals have been interested in rethinking their processes in terms of automation and deepening their understanding of the matter.

RPA studies are recent and focused on analyzing the impact on business. It is worth mentioning that most market research was developed by the major accounting firms that are applying RPA to achieve cost savings and increase operational efficiency in tax and consulting services. For example, KPMG, since 2018, has been working in partnership with a global leader in Enterprise RPA to help customers automate

manual business processes (KPMG, 2018). As one of the largest RPA consultants, Deloitte (2019) presented a survey on 523 organizations worldwide that reported a projection of a 22% reduction in operating costs and improvement of 88% in the accuracy of information generated by automated processes with the implementation of RPA.

From an accounting perspective, manual and repetitive audit tasks such as reconciliations, internal control tests, and detail tests can be automated. With automation, auditors would be able to allocate more resources to complex audit areas or to investigate items that are potential anomalies, leading to higher audit quality (Moffitt, Rozario and Vasarhelyi, 2018). Because many areas of finance and accounting involve tasks that interact with multiple systems, contain high levels of processing transactions, and require few decisions to make, the potential for RPA use in these areas is high (Le Clair, 2017). One of the examples of RPA applications in the accounting field is related to taxes. For example, after the creation of automation software, robots are configured to perform repetitive processes, such as sending applicative functions to a tax authority portal (Zhang *et al.*, 2020). Therefore, the potential of RPA is both numerous and of considerable impact: rationalization of daily tasks, cost reduction, performance and productivity gains, but also improvements in human *know-how* within the company.

It is worth noting that the automation of RPAs is only part of the digital transformation process. There are factors such as the revision of processes and professional development, which are essential for its deployment. A study by (EY, 2019) revealed that 30% to 50% of initial RPA projects failed during their implementation. The main critical points highlighted were: absence of process risk analysis, professional preparation, solution testing, access controls and management of the changes.

In addition to points highlighted, Kokina and Blanchette (2019) pointed out various restrictions on the use of RPA, because organizations benefit from the automation of only a few processes, which are structured, repetitive, based on rules and involve digital input. Other sources point to the difficulties of understanding the process and managing the changes involved (PWC, 2020). Therefore, it is important for academics and accounting professionals to assess the benefits as well as potential risks involved in implementing RPA.

Finally, in relation to the concern of professionals with the automation of all tasks, (Knudsen, 2020) warns that robotic process automation (RPA) will not totally reduce all such tasks, but will clearly result in changes to the tasks that need to be performed by human beings. In other words, accountants will still play a role in the organization, but digitization is likely to substantially challenge their role.

2.2 ARTIFICIAL INTELLIGENCE (AI)

In recent years, there has been a noticeable evolution in the technological artifacts that surround society in its most varied perspectives and one of these is Artificial Intelligence (AI). AI includes innovations such as machine learning and natural language processing, as well as statistical techniques

known for decades, such as classification and grouping (Sutton, Holt and Arnold, 2016). In some literature this technology is defined as synthetic intelligence or computer system intelligence that simulates intellectual functions. In a practical way, AI technologies perform tasks that previously required human intelligence, such as extracting meaning from images, texts, or speech, detecting patterns and anomalies, and making recommendations, predictions, or decisions. These include machine learning, deep processing, and natural language generation (Deloitte, 2019).

In accounting, AI is gaining more and more space. Chase and Shim (1991); and O'Leary (1991) already contemplated the application of AI in useful devices to facilitate the organization, storage and application of intelligence for accounting database systems. However, with technological advances there was an expansion in its performance. AI used by professionals and organizations such as the *Big Four*, which have their own robots capable of automatically recognizing data, entering invoices and generating financial reports, as well as detecting fraudulent invoices and assisting with tax returns, reduced processing (Zhang *et al.*, 2020).

The IBM Watson platform provides conventional decision support through data analysis and visualization, as well as 'true' AI using questions posed in natural or normal language (IBM, 2018b). The use of Neural Networks, AI tools for the detection and control of risk, increasing auditors' ability to predict and reveal fraud in financial statements (Omoteso, 2012).

In Brazil there are already applications in the accounting area that use artificial intelligence mechanisms such as: tax calculation, classification of documents, automation of the relationship with customers, as well as detecting audit points. However, there are many areas to explore such as automating internal accounting processes using cognitive computing and predictive management actions based on trends and behaviors. Therefore, it is necessary to investigate the current development of AI applications in the accounting profession.

2.3 BLOCKCHAIN

Blockchain is a type of distributed ledger technology in which multiple copies of the same ledger are shared among the members (us) of a large network. The technology is considered highly promising by many organizations (Moll and Yigitbasioglu, 2019; Zhang *et al.*, 2020) . This technology makes data transparent and reliable and eliminates the need for a trustee, such as an accountant or notary (Diller, Asen and Späth, 2020).

Usually when quoting Blockchain the first application imagined is the financial market, especially with the advances that have occurred with *Bitcoin.* However, other initiatives are emerging in the accounting sector, such as with the Big Four (PWC, Deloitte, EY and KPMG) that have already begun to explore this nascent or recent technology in their business practices. PWC and KPMG are working on platform development to improve digital assets and services, while Deloitte is studying the use of

blockchain to improve the supply chain, while EY experiments with editable blockchains (Karajovic, Kim and Laskowski, 2019). In short, there are many Fields to be explored in relation to the opportunities with Blockchain.

One of the advantages of Blockchain platforms is to offer real-time features ensuring integrity and transparency for everyone involved. Other advantages are expected with the use of blockchain in accounting, as shown in the table below:

Blockchain Resources and Applications in Accounting

Blockchain Recources	Potential Impact on Accounting
Triple Entry	The triple entry by which the system automatically confirms the debit / credit entry registered for each party in a transaction, would ensure greater accounting reliability.
Entries registered in real time	Streamlines the production of reports and financial statements. Help identifying hidden accounts or incorrect entries.
Traceability of historical data	Accuracy and efficiency in financial management and performance in general.
Speed of access to numbers	Useful management information, avoiding poor practices and bottlenecks in management. Significantly reduces the time required to verify accounting entries. The scope of the audit in relation to the analysis becomes more aggregated and accessible to accountants.
Automated taxation	Mitigate tax evasion by providing an immutable platform through which taxes can be collected in real time
Smart Contracts	Streamlines the registration process by instantly updating account information and tracking supply chains through real-time analyses

Chart 1: *Adapted from (Karajovic, Kim and Laskowski, 2019)*

Even though the technology has the potential to reshape capital markets as a whole, a tension still needs to be taken into account in relation to the social and political barriers that prevent blockchain proliferation. In addition, blockchain expansion comes with some barriers, posing questions around cybersecurity and scalability.

Accounting professionals will not be the central authority of a blockchain, but will likely remain as the party responsible for a company's financial reports, as required by regulations for corporate governance purposes (Tan and Low, 2019). Accounting professionals should be aware of the impact of blockchain on accounting services. In addition, they will need to acquire new skills to adapt to changes in work requirements for existing and emerging accounting positions.

2.4 *BUSINESS INTELLIGENCE (BI) AND BIG DATA*

The increasing volume of information and its potential in strategic business management, demands a structure and control that makes the decision-making process more efficient. Faced with this need, Business Intelligence or its acronym BI arose. Basically, BI has been widely described as "a set of techniques and tools for acquiring and transforming raw data into meaningful and useful information for business analysis purposes" (Appelbaum *et al.*, 2017). That is, it is a set of techniques and tools that aim

to support decision making and monitoring of companies results.

According to Belfo and Trigo (2013) BI often involves processes such as data mining, process mining, statistical analysis, predictive analysis, or predictive modeling, which can support various management accounting issues, such as forecasting, or other management support concerns, such as identifying and analyzing strategic options, decision support, and business risk management. The advantages of employing BI tools are numerous, increasing velocity on decision making, with reliable data, enhancing the efficiency of operations and optimizing processes. Therefore, this decision-making support is offered by Business Intelligence because of the ease of viewing analysis and reporting resulting from the processes.

Business intelligence (BI) technologies facilitate data collection, analysis, and information delivery and are designed to support decision making. Since management accounting is a decision support activity, there is an obvious link between BI and accounting. Therefore, management accounting has much to gain from the successful integration of BI techniques into management accounting tasks (Rikhardsson and Yigitbasioglu, 2018; Shen and Zheng, 2020).

Thus, to ensure the reliability of the information used in BI tools, a structured and consistent database is needed, i.e., we are talking about *Big Data.* According to Coyne *et al*. (2018), Janvrin and Watson (2017) *Big Data* has three features: Volume - large amounts of machine data, transactions and social media interactions; Speed - high rate at which large amounts of data are created, processed and become obsolete; and Variety - describing the different data sources containing text, audio, video, image, and other data types. In accounting, Big Data presents large amounts and new forms of structured, unstructured, and semi-structured data, so it requires alternative methods of data management and reporting (Perkhofer *et al.*, 2019).

While data sets are now larger than ever *(Big Data)* and better analytical software data *(BI)* is available, the main goal of accounting has always been the same - to create and provide information for internal and external decision makers. For this reason, these digital technologies should be deployed simultaneously in organizations in order to ensure efficient data analysis. That is, it is almost impossible to analyze data if it is not properly structured.

This relationship of dependency between *BI and Big Data*, appears in academic accounting studies, as an example: BI supporting specific accounting tasks, such as profitability analysis (Kowalczyk and Buxmann, 2015); studies on the quality of BI (infrastructure integration, functionality and self-service) and the roles these play in improving diagnostic performance measurement capabilities (Peters *et al.*, 2016); the reach of big data for existing management accounting practices, such as influencing budgeting processes (Moll and Yigitbasioglu, 2019); presenting several opportunities for Accounting professionals with exploratory analysis in big data and BI (Richins *et al.*, 2017), amongst others.

Given the scope and importance of information for the management of organizations to remain

competitive, knowledge in BI tools and notions of *Big Data* have become essential for accounting professionals.

2.5 IOT – INTERNET OF THINGS

The Internet of Things (IoT) describes the network of physical objects - "things" – that are incorporated into it such as sensors, software and other technologies in order to connect and exchange data with other devices. These devices range from common household objects to sophisticated industrial tools. According to Gartner's estimates (2017), by 2020, IoT technology would possibly have already been incorporated into 95% of electronics in new product projects. By 2050, everything is expected to be connected to the cloud and the internet.

Accounting is being heavily impacted by the growing influence of IoT. According to AICPA (2016) "IoT has the potential to revolutionize the way companies collect data - and, in the process, transform many aspects of accounting and auditing." Here are some examples: increasing the amount of data, increasing the importance of risk management and cybersecurity, in addition to improvements through automated auditing and peer review.

Academic studies in relation to IoT are still recent and restricted. One of these is the study by Valentinetti and Flores (2021) that analyzed how each element of corporate communication can be reshaped with the advent of the IoT phenomenon. An interesting experiment is the study of Qiu (2016) which presented the characteristics of IOT technology and accounting information integrating radio frequency technology into the accounting information platform. However, all studies related to digital technologies indicate that IoT will bring IT and accounting closer and professionals in both areas will need to work together to determine data types and ways of collecting and controlling these.

2.6 APPLICATION PROGRAM INTERFACE (API), CLOUD SYSTEMS AND CHATBOTS

The API (*Application Program Interface*) consists of a set of routines and standards established by software for its functionality to be used by applications. It is a programming interface necessary for a system to communicate and interact with another system. In other words, the API acts as a bridge between different systems, sharing its actions, standard tools, and protocols. In accounting management, the use of the API has become quite common, mainly because this area receives information from all sectors and provides data to other digital tools for decision support.

Among the advantages of using APIs are: keeping data synchronized across multiple applications, avoiding redundant data entry, and establishing automated workflow operations. Despite the advantages and expansion of APIs in the accounting market, no academic studies on the impacts of this digital technology on accounting have been identified.

On the other hand, studies on digital cloud technology in Accounting are more frequent and recent.

However, before we go into the impacts, it is important to clarify the relationship between cloud accounting and cloud computing. Authors, Mell and Grance (2009) defined cloud computing as a model that provides, on-demand, network access to share configurable computing resources, which can be provided quickly and require minimal management effort and interaction of the service provider. In another study of Mell and Grance (2011) various benefits of cloud computing were identified such as improved data protection, better quality finance reports, advanced decision-making process, efficient use of organizational resources, which were brought by cloud computing to the area of accounting. That is, the structure of cloud computing is fundamental to accounting's objectives.

The academic studies carried out seek to compared conventional accounting models with those in the cloud (Saha *et al.*, 2020; Xu, 2020) identifying users' perception of the cloud accounting model by market (Le e Cao, 2020), more specific studies, such as the impacts on internal and external audits (Liu e Vasarhelyi, 2014), as well as recent studies regarding forensic risks in cloud accounting (Hashem, 2021).

With the pandemic that plagued the world in 2020, cloud-based technologies have demonstrated their value and resulted in their wide expansion. According to Gartner research (2020) the proportion of IT spending that is moving to the cloud will accelerate after the COVID-19 crisis, with cloud solutions projected to account for 14.2% of the total spending in the IT market in 2024, up from 9.1% in 2020. That is, cloud accounting is the ideal model to apply to organizations.

Just as cloud accounting is consolidated in the market, chatbot is following in the same steps. Chatbot was created in the 1960s by computer scientist and MIT (Massachusetts Institute of Technology) researcher Joseph Weizenbaum to simulate human interaction: the Eliza software. The chatbot principle was simple: emulate a psychotherapist who interacted and asked questions according to the terms entered by users during the conversation. Since then, the chatbot has undergone adaptations, using natural language (PLN) and machine learning to process a large volume of data and offer adequate answers. In addition, since the launch of Siri (Apple's Chatbot Assistant) in 2010, chatbot solutions have undergone several modifications to take account of new features, as well as offer a more "realistic" experience, such as an increasingly natural voice. Chat bots are AI-powered, which in turn relies on machine learning and is flexible enough to allow the seller to take over as needed for more complex sales. The simplest chatbots, called rules-based chat bots, use specific key words (Syam and Sharma, 2018).

Accounting has gradually inserted the functionalities of chatbots in some of its activities: the most basic accounting tasks: downloading invoices, filling out forms, doing research on regulations and other information; fulfilling repetitive activities, such as downloading documents directly from the issuing body; analyzing and gathering data: all interactions between humans and chatbots generate data that is consolidated and fulfills the function of virtual accountants, such as opening companies and provide other accounting services.

Digital technologies such as Cloud, ChatBots and APIs are terminologies that have emerged in

computing but are widely used in Accounting and many are part of the day-to-day of the accounting profession and in some cases even replaced some of the activities performed for years by these professional.

2.7 DIGITAL TECHNOLOGY IN THE FORMATION OF ACCOUNTING PROFESSIONALS

According to the National Council of Education (CNE, 2004) which establishes the national curriculum guidelines for undergraduate courses, the Undergraduate Course in Accounting Sciences should include among the competencies and skills: *developing, analyzing and implementing accounting information systems and management control, revealing analytical critical capacity to assess the organizational implications with information technology.* In other words, it is expected that within the undergraduate course the study of digital technology will be included in the make-up of the disciplines taught.

Despite the importance of digital technology in the formation of accounting professionals, the exploration of concepts and applications depends on the emphasis given by the teacher in the discipline of *Management Information Systems.* Carneiro *et al.*, (2017) presented a proposal for the curricular matrix of the undergraduate course of accounting sciences in Brazil highlighting in the content of professional formation the discipline of *Management Information Systems* and adds as optional curricular components *Information Technology.*

The shortened approach to digital technology in the formation of undergraduate accounting professionals has some direct impacts on the inclusion of these professionals in the labor market, such as: the need for investments in extra courses in digital technology and restriction in job opportunities that require this technical knowledge. Doost, McCombs and Sharifi (2003) stresses that a clearly presented curriculum structure and the relationship between accounting and information systems and technologies are the first step in influencing the aspirations of accounting students to seek courses and opportunities in this area.

3 METHODOLOGY

In this section we will present the methodology used in our research, characterized as exploratory and descriptive. According to Gil (2018) exploratory research provides greater familiarity with the problem (explain it) and generally takes the form of bibliographic research. According to the same author, descriptive research describes the characteristics of certain populations or phenomena. One of the peculiarities of descriptive research is the use of standardized data collection techniques, such as the questionnaire and systematic observation.

Our research covers graduate students from a private university that offers courses throughout Brazil. The questionnaire was sent to 500 students in the Postgraduate Course in Accounting, Compliance

and Tax Law from October to November 2020 to evaluate their knowledge and applications of digital technology. The response rate was about 20.8%, corresponding to 104 respondents.

The collection method used was online and included direct questions, divided up as follows: 5 questions on the identification of the respondent (age group, job, state, and educational level), 2 technical questions on knowledge and application for each digital technology and, finally, 1 question on the evaluation of the impacts of technologies on the professionals.

For both technical questions, the digital maturity scale was buildup based on the Linkert model, which aims to verify the professional's level of knowledge and application of the digital technology. In addition, we treated the *Linkert* scale with four points, with the objective of the participants completing the questionnaire in less than 2 minutes and having a greater participation.

4 RESULTS AND ANALYSIS

Despite the low number of respondents, we were able to collect data from professionals in 15 federative states and 5 regions of the country, presented as follows (Table 1):

Table 1: Quantity of Respondents per Region

Region	Quant. Respondents	Percentage
Central West	7	6,73%
Northeast	10	9,62%
North	17	16,35%
Southeast	55	52,88%
South	15	14,42%
General Total	**104**	**100,00%**

Source: Prepared by the authors

Regarding the age group, the highest concentration of respondents (36%) was in the 40 to 49 age group; 30% indicated that they were between 50 and 64 years old; 21% between 30 and 39 years old; 8% between 25 and 29 years old; 4% between 18 and 24 years old and only 1% were over 65 years old. It is worth noting that 64% were female and 36% male.

Regarding their last or current occupation, the participants indicated: Accountant (56%), Analyst (14%), Director (8%), Coordinator (7%), Specialist (6%), Manager (4%), Auditor and Assistant, respectively (2%), and Expert and Supervisor (1%) each.

In order to answer the question under study, which is to understand the maturity of the professionals in relation to digital technologies, we elaborated a specific question about the level of knowledge for each of them, as follows:

Table 1: Level of Knowledge

Options	Explanation
1 – Do not know	Unaware of the Technology
2 – low knowledge	I know what it is, but cannot explain it
3 – average knowledge	I know what it is and can explain it to someone else
4 – high knowledge	I know what it is and can demonstrate examples

Source: Prepared by the authors

Analyzing the results, we found that an average of 27% of the respondent were not fully aware about the digital technologies in the questionnaire. Detailing by technologies we have the following segmentation (Table 2):

Table 2 – Digital Technologies no knowledge by Respondents

Digital Technologies	***% No knowledge***
Blockchain	48,08%
Iot	38,46%
Bigdata	35,58%
API	33,65%
Chatbot	25%
BI	23,08%
RPA	17,31%
Cloud	12,50%
IA	9,62%

Source: Prepared by the authors

To move deeper into the level of maturity of technologies we selected the variable *occupation* to evaluate, per digital technology, the level of knowledge. Table 3 shows that there was a higher percentage of ignorance or low knowledge about digital technologies amongst accountants. It is important to highlight that 20% of accountants had low knowledge about RPA, and this technology is expanding substantially in accounting. With the exception of AI (24.04%) which presented a rate of medium knowledge, 19% to 32% of accountants were unaware of the concepts of these digital technologies and impacts on accounting.

Table 3 – Maturity of Accounting Professionals per Occupation

	1 - NO KNOWLEDGE	*2 - LOW KNOWLEDGE*	*3 – AVERAGE KNOWLEDGE*	*4 – HIGH KNOWLEDGE*
IA				
Analyst	0,00%	2,88%	10,58%	0,96%
Auditor	0,00%	1,92%	0,00%	0,00%
Auxiliary	0,00%	1,92%	0,00%	0,00%
Accountant	6,73%	17,31%	24,04%	7,69%
Coordinator	0,96%	0,00%	4,81%	0,96%
Director	0,96%	2,88%	1,92%	1,92%
Specialist	0,00%	1,92%	2,88%	0,96%
Manager	0,00%	0,96%	1,92%	0,96%
Expert	0,00%	0,96%	0,00%	0,00%
Supervisor	0,96%	0,00%	0,00%	0,00%
RPA				
Analyst	2,88%	1,92%	3,85%	5,77%

Auditor	0,00%	0,00%	1,92%	0,00%
Auxiliary	0,96%	0,96%	0,00%	0,00%
Accountant	8,65%	20,19%	19,23%	7,69%
Coordinator	1,92%	0,96%	2,88%	0,96%
Director	1,92%	0,00%	4,81%	0,96%
Specialist	0,00%	0,00%	4,81%	0,96%
Manager	0,00%	1,92%	1,92%	0,00%
Expert	0,00%	0,96%	0,00%	0,00%
Supervisor	0,96%	0,00%	0,00%	0,00%
BlockChain				
Analyst	4,81%	4,81%	4,81%	0,00%
Auditor	0,96%	0,00%	0,96%	0,00%
Auxiliary	1,92%	0,00%	0,00%	0,00%
Accountant	32,69%	12,50%	10,58%	0,00%
Coordinator	2,88%	1,92%	0,96%	0,96%
Director	0,96%	2,88%	1,92%	1,92%
Specialist	0,00%	1,92%	2,88%	0,96%
Manager	2,88%	0,00%	0,00%	0,96%
Expert	0,00%	0,96%	0,00%	0,00%
Supervisor	0,96%	0,00%	0,00%	0,00%
IOT				
Analyst	1,92%	5,77%	5,77%	0,96%
Auditor	0,00%	0,96%	0,96%	0,00%
Auxiliary	1,92%	0,00%	0,00%	0,00%
Accountant	28,85%	16,35%	9,62%	0,96%
Coordinator	2,88%	1,92%	0,96%	0,96%
Director	0,96%	0,96%	2,88%	2,88%
Specialist	0,00%	0,00%	3,85%	1,92%
Manager	1,92%	0,96%	0,00%	0,96%
Expert	0,00%	0,96%	0,00%	0,00%
Supervisor	0,96%	0,00%	0,00%	0,00%
BigData				
Analyst	3,85%	1,92%	3,85%	4,81%
Auditor	0,96%	0,00%	0,96%	0,00%
Auxiliary	1,92%	0,00%	0,00%	0,00%
Accountant	22,12%	17,31%	16,35%	0,00%
Coordinator	2,88%	1,92%	0,96%	0,96%
Director	1,92%	1,92%	1,92%	1,92%
Specialist	0,00%	1,92%	1,92%	1,92%
Manager	0,96%	0,96%	0,00%	1,92%
Expert	0,96%	0,00%	0,00%	0,00%
Supervisor	0,96%	0,00%	0,00%	0,00%
API				
Analyst	4,81%	0,96%	7,69%	0,96%
Auditor	0,96%	0,00%	0,00%	0,96%
Auxiliary	1,92%	0,00%	0,00%	0,00%
Accountant	21,15%	14,42%	17,31%	2,88%
Coordinator	1,92%	1,92%	2,88%	0,00%
Director	0,00%	1,92%	4,81%	0,96%
Specialist	0,00%	1,92%	2,88%	0,96%
Manager	1,92%	0,96%	0,00%	0,96%
Expert	0,96%	0,00%	0,00%	0,00%
Supervisor	0,96%	0,00%	0,00%	0,00%
Cloud				
Analyst	1,92%	0,96%	5,77%	5,77%
Auditor	0,00%	0,00%	0,00%	1,92%
Auxiliary	0,00%	0,96%	0,96%	0,00%

Accountant	9,62%	20,19%	17,31%	8,65%
Coordinator	1,92%	0,00%	2,88%	1,92%
Director	0,00%	0,00%	3,85%	3,85%
Specialist	0,00%	0,00%	3,85%	1,92%
Manager	0,00%	0,96%	0,00%	2,88%
Expert	0,00%	0,96%	0,00%	0,00%
Supervisor	0,00%	0,96%	0,00%	0,00%
Chat Box				
Analyst	2,88%	4,81%	3,85%	2,88%
Auditor	0,00%	0,96%	0,00%	0,96%
Auxiliary	0,96%	0,96%	0,00%	0,00%
Accountant	19,23%	20,19%	9,62%	6,73%
Coordinator	0,96%	0,00%	5,77%	0,00%
Director	0,00%	1,92%	1,92%	3,85%
Specialist	0,00%	0,00%	4,81%	0,96%
Manager	0,00%	0,96%	1,92%	0,96%
Expert	0,96%	0,00%	0,00%	0,00%
Supervisor	0,00%	0,96%	0,00%	0,00%
BI				
Analyst	0,96%	6,73%	3,85%	2,88%
Auditor	0,00%	0,00%	0,96%	0,96%
Auxiliary	0,96%	0,96%	0,00%	0,00%
Accountant	19,23%	16,35%	16,35%	3,85%
Coordinator	0,96%	1,92%	1,92%	1,92%
Director	2,88%	0,96%	1,92%	1,92%
Specialist	0,00%	1,92%	1,92%	1,92%
Manager	0,96%	0,96%	0,96%	0,96%
Expert	0,00%	0,96%	0,00%	0,00%
Supervisor	0,96%	0,00%	0,00%	0,00%

Source: Prepared by the authors

We also inquired about the usability of these digital technologies in Accounting. Highlighting in the research 4 options: do not use, low use (use in some processes), medium use (use in several processes) and high use (use in all processes). The synthesis, presented in Table 4, indicates that the Cloud is the technology with highest use by companies and professionals, the API with medium use, in contrast to RPA and Artificial Intelligence that are still low used by the respondents.

Table 4 – Use of Digital Technologies by Professionals

DIGITAL TECNOLOGIES	*NO USE*	*LOW USE*	*AVERAGE USE*	*HIGH USE*
BLOCKCHAIN	86,54%	13,46%	0%	0%
IOT	70,19%	22,12%	3,85%	3,85%
API	47,12%	24,04%	17,31%	11,54%
CHATBOT	67,31%	17,31%	11,54%	3,85%
BI	51,92%	28,85%	15,38%	3,85%
RPA	39,42%	27,88%	22,12%	10,58%
CLOUD	30,77%	24,04%	27,88%	26,92%
IA	53,85%	29,81%	14,42%	1,92%

Source: Prepared by the authors

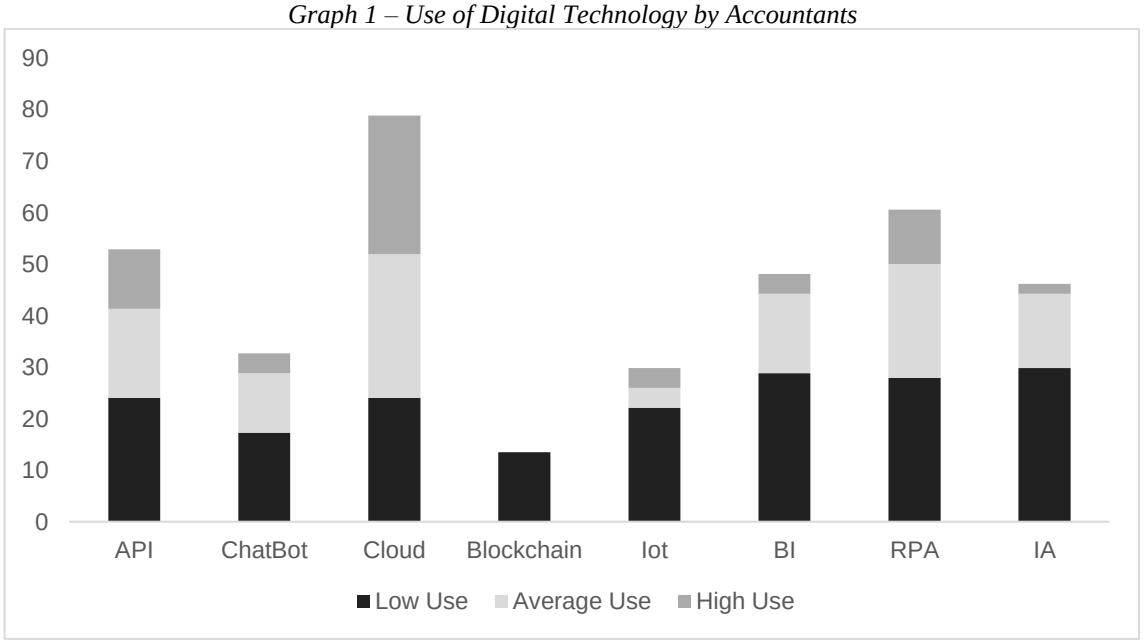
During the analysis of the results, attempts were made to draw a relationship between the degree

of knowledge and the use of the digital technologies, however this point was not taken further, as it would require exploring studies on knowledge management. Thus, we focused on the use of technology, considering as part of the process of knowledge training of professionals. Le Coadic (2004) defining that usability, focused on information science, as well as the extent to which a product or system, service or information lends itself to use. It is a fundamental concept alongside the concepts of utility, effectiveness, and reliability.

Thus, we considered that during the use of the technology there was a learning curve by accounting professionals, without the effective need to know the details. This scenario is evidenced in the research when it mentions that 26.92% of the participants have high use of tools in *Cloud,* however most respondents were concentrated in the low to medium knowledge bracket. That is, they know that the tools they use daily are in the *Cloud,* but they cannot explain how the technical operation functions.

In order to prove the use of digital technology, we also selected professionals classified as **accountants**, who represented more than 50% of the respondents to the study. There was still a low use of the technology by this group, although they did already recognize these as fundamental (Graph 1).

Graph 1 – Use of Digital Technology by Accountants



Source: Prepared by the authors

During the survey, the question was also raised as to whether digital technology would be an opportunity or a threat and 96.15% of the respondents agreed that they would consider it as an opportunity. That is, despite the high rate of ignorance or it´s low use, accounting professionals recognize the importance of these technologies for their profession.

5 FINAL CONSIDERATIONS

This study focused on nine influential Internet-related technologies (RPA, IOT cloud, big data,

blockchain, BI, APIs, Chatbot and AI) and their implications for the activities of accounting professionals. The academic literature pointed out is emphatic in highlighting the relevance and expansion of digital technologies in organizations. Despite the imminent threat to the performance of professionals by these technologies, it is important to highlight that in this study we highlighted the technology created in Accounting, and this is also the view of professionals in the area, as revealed in our research. The innovations will replace repetitive, bureaucratic activities with previously defined rules, generating agility in the areas of management accounting, financial accounting and auditing, amongst others. However, this study demonstrated that it is necessary for the accounting profession to be vigilant in the development of their skills and the policies necessary to effectively govern the implementation and use of these technologies in organizations, because there is still low knowledge and use of these technologies, that is, the level of digital maturity among these professionals is still low.

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