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Emerging technologies in accounting: a threat or an opportunity for the accounting profession?

Compiled by:
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*This project is submitted in part fulfilment of the Degree of Bachelor of Arts
(Honours) in Accounting and Finance*

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ABSTRACT

Technological advancements have always existed in civilization. They are a component of human culture and growth. We are now presently in the fourth industrial revolution, which is characterised by growing automation, smart equipment, and smart manufacturing. Accurate data allows for more efficient and productive manufacturing throughout the value chain.

Automation, artificial intelligence, big data, blockchain, and cloud computing have all dramatically increased as a result of the fourth industrial revolution. This revolution has altered the way we live, communicate, and work. It has transformed accountants' day-to-day jobs in the accounting profession. RPA (robot process automation), for example, is now widely used to perform repetitive and rule-based procedures, replacing manual labour more quickly and precisely while simultaneously providing a competitive edge to businesses. Much has been stated about how these technologies would replace and eliminate some professions, but they will also change and create new ones. Considering that, the research's objective is to analyse the benefits of these technologies in accounting and the professionals' expectations about the future.

The interpretivist method was most effective in gathering information because it utilises an inductive approach through mixed methods. Thus, three interviews were carried out with professionals of the accounting area in addition to the online survey, where there were 52 voluntary participants.

The purpose of the research was to determine if the increase use of technology in the accounting sector is a threat or an opportunity for accountants by demonstrating its advantages and disadvantages, challenges and how to adapt to the new requirements.

So, it can conclude that accounting professionals are confident and with high expectations regarding to the new technological trends. Most people realize that benefits such as accuracy and time savings are factors that contribute to increasing the value of the profession and to the important analytical and strategic role that the accountant comes to play within an organization.

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LIST OF ACRONYMS

4IR – 4th Industrial Revolution

AI – Artificial Intelligence

RPA – Robotic Process Automation

ATM - Automated Teller Machines

CAGR - Compound Annual Growth Rate

SAP - System Analysis Program

ICAEW - Institute of Chartered Accountants in England and Wales

ACCA - Association of Chartered Certified Accountants

CPA - Certified Practising Accountant

PwC - Price Waterhouse Coopers

CEO – Chief Executive Officer

SQL - Structured Query Language

KPMG - Klynveld Peat Marwick Goerdeler

BG – Background Remover

ML - Machine Learning

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CHAPTER I

Emerging technologies in accounting: a threat or an opportunity for the accounting profession?

Introduction

The world is being ruled by technology, and the accounting industry is no exception. This industry is rapidly evolving, and new accountant jobs and abilities have necessitated the development of a new generation of accounting professionals. The new essential qualifications for accounting professionals include knowledge and abilities in Blockchain, Artificial Intelligence, Cloud, and how to manage an automated system.

1.1 Research Aim

My goal is to show how developing technologies are being spread in the accounting sector and how they might be disruptive, but also how the potential for individuals willing to adapt and learn new skills are limitless.

1.2 Purpose of Study

The goal of this study is to analyse the emerging technologies that respondents are now using and to understand how technologies influence the workforce, in creating new skills and the advantages of it in everyday work, and as a future accountant, to analyse the profession's future aspirations.

1.3 Research Objectives

The research was separated into four themes, each with its own sub-research question, to assist answer the research question.

- Focus on identify the technologies currently used by responders in the accounting field;
- Asses the advantages (and disadvantages if any) that emerging technologies bring to everyday work;
- Comprehend the objections faced during the adaptability process and the new skill required from accounting professionals;
- Evaluate the accountant's profession expectations about the future in relation to the increase of technology in the field.

1.4 Information Gathering and Data Collection

The material for the study's analysis was gathered through interviews and an online survey of accounting professionals. The interview questions were open-ended, allowing the researcher to acquire more detailed information while also allowing participants to express their thoughts. Simultaneously, close-ended questions were used on the survey to acquire quantitative data from respondents.

1.5 Expected Outcomes

It is expected to hear from the interviewees their experiences, thoughts and assumptions regarding to future of the profession.

1.6 Chapter Overview

Chapter I - The first chapter of the research, describes its background and objective. Additionally, it outlines the themes into which the research was split, how the data were collected, and the outcomes expected with the research;

Chapter II - This chapter discusses the literature review and the opinions of different writers on the four study proposed themes;

Chapter III – This chapter outline the appropriate method used for the research and data collection, along with sampling and the data analysis process;

Chapter IV – In this chapter the opinions from the literature review are triangulated with the quantitative data collected from the survey and the qualitative data from interviews to determine whether they agree or disagreed about the proposed themes;

Chapter V – In this chapter, the main research question is answered at the conclusion of the study. The limitations found during the research process are outlined, and recommendations for future studies in this area are proposed.

CHAPTER II

Emerging technologies in accounting: a threat or an opportunity for the accounting profession?

Literature Review

2.1 Introduction

Due to the emerging technologies, the accounting industry as we know it will undergo a great deal of change in the upcoming years. With the speed at which technology advancements are occurring, this phenomenon is becoming more and more obvious. Numerous causes have contributed to changes, including quick technology advancements, increased globalization and ease of communication through the internet, and legal and regulatory reforms. These changes may be disruptive, but they also present a great deal of potential prospects for the field.

Based on the research question, this literature review aims to explore the relationship of Industry 4.0 and the accounting sector and how it has impacted the accountant's career.

The accountant's profession changed a lot over the years. It began with the invention of the abacus, used to keep calculations in business (Pepe, 2011). Calculators or add-machines created later come to accelerate and bring more accuracy to mathematical solutions.

The fourth industrial revolution, also known as Industry 4.0 or 4IR, has introduced significant technical breakthroughs to the accounting profession. The speed at which these technological innovations spread are transforming the accountant's work routine and impacting its profession, and they need to get ahead of the game and ensure they are not left behind (Skolding, 2018).

Throughout history, the process of creative destruction, following technological inventions, has created enormous wealth, but also undesired disruptions (Frey & Osborne, 2013). The advances in technology are replacing several human's work and many professions are becoming obsolete and disappearing. However, Pepe, (2021) believes that in the accounting sector it has always played a part in making the accountant's job just a little easier. With the technological advancements, the invention of computers, software and several tools, accounting processes have been automated, enabling certified accountants to complete their work more effectively and with less error (ICAEW, 2021). Gardner and Bryson (2020) suggests that "Some of these impacts highlight that there is perhaps always a darker side to innovation; innovation simultaneously destroys and creates tasks/jobs".

2.2 Emerging Technologies in Accounting

The quickest period of invention in history has already begun in the digitally equipped 4IR. The foundation of this wave of innovation is the quick development of technologies such as robotics, nanotechnology, artificial intelligence, the internet of things and others. Gustafsson & Jerkinger, (2021) address that this is a highly debated phenomenon in the related profession of accountant, and it can be connected with four concepts: Artificial Intelligence, Big Data, Cloud Accounting and Blockchain. There are also lots of articles about Automation or RPA – Robotic Process Automation. It is the use of computer software that imitates human reactions and executes repetitive, rule-based tasks. According to Kaya et al. (2019), the robotic software eliminates the human dependency by freeing human employees from these routine tasks to give a chance to focus on core business objectives and operations.

Artificial Intelligence (AI) is a computer-controlled robot that is capable of executing tasks simulating human intelligence. AI support four technologies: natural language processes – which includes voice recognition, real-time demand and others; Machine and Deep Learning - ability for computers to essentially program themselves by making their own predictions and decisions based on the data they have already come across (Duffy, 2018), for example ATM machines; Computer vision – which allows recognition through images; and Artificial General Intelligence – which includes data analysis, tax preparation and bank fraud detection. As such, its application areas are broad, with the most well-known areas being accounting, customer service, and human resource (Najem et al., 2022). In the accounting field, Mordor Intelligence, (2022) projects that the use of this technology will have a Compound Annual Growth Rate (CAGR) of 30% between 2022 and 2027.

Big Data is defined by Gartner, (n.d.) as “high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation.” Through Big Data, accountants can comprise a huge volume of data with analytic techniques to analyse internal and external aspects of the business. Big data is valuable as a source of financial data to support business decision-making (Zhang, et al., 2020). Chiheb et al., (2019) says that “*Big data is successfully used in many sectors of modern society to derive business insight from the data generated by the daily activity of each sector and other sources of data*”.

Cloud accounting comes from the idea that a software can be accessed online from anywhere at any time. Via this virtual accounting information system, data is sent into “the cloud”, where it is processed and returned to the user. All application functions are performed off-site, not on the users’ desktop, which frees the business from having to install and maintain software on individual desktop computers (Khanom, 2017), allowing accounts to execute its task

remotely wherever it is necessary. Enables the delivery of computer applications and services over the internet, reducing storage and computer power needs. Big data enabled by cloud allows predictive relationships to form, underpinning optimisation (PwC, 2017).

Blockchain is the most recent technology. It is a distributed electronic ledger that uses software algorithms to record and confirm transactions with reliability and anonymity (PwC, 2017). Its most well-known application was on Bitcoin in 2009 by offering a system where the recorded transactions are distributed and decentralised across the network without a third-part intermediate. It makes this technology proof of theft and attack. Blockchain has the potential to increase the efficiency of the process of accounting for transactions and assets, operating as a system of universal entry bookkeeping (ICAEW IT FACULTY, 2018).

As described by the author these emerging technologies are in everyday work of accountants improving the time efficiency and by creating real-time access to financial data. Although there are several technologies, my aim with this theme is to understand which technology is more present in the daily lives of accounting professionals.

2.3 Benefits and improvements

A key benefit of technological developments is the removal of the need for slow, manual processes, enabling accountants to spend more time on adding value to the business (Skoulding, 2018).

There are some accounting tasks that have been more affected by automation than others, such as tasks that are based on simple algorithmic processing of numerical data, for example bookkeeping, payroll and invoicing. *“Robotic process automation can create a 25-50% cost savings; enables 24x7x365 execution and can work error-free, and is relatively costly when compared with human work and capacity”* (Kaya et al., 2019, 240). The author cited several other benefits including higher efficiency, performance and quality improvements, accuracy and decreased cycle times. Performance close and consolidating activities through bank reconciliations, planning and budgeting considering different scenarios, reports and many other repetitive, rule-based, involve digital data and time critical and seasonal can be automated. Among the advantages of RPA Deloitte, (n.d), enumerate: decreased cycle times and improved throughput, flexibility and scalability, improved accuracy, add-value, allows time to innovate and focus on customer satisfaction and data capture.

In fact, accountants can benefit from the intelligent systems as by using their capabilities they will be able to solve three broad problems (ICAEW 2017, p. 8): support decision-making by providing better and cheaper data; provide more profound analysis of data and give new insights on business; focus on more valuable tasks after freeing up working time due to AI applications (Todorova, 2018).

The beauty of machine learning is that the more data the system ingests, the better it performs (CPA, n.d.). It helps accounting professionals monitor what happened, why it happened and predict what will happen in the future and advise in real time what is the best to do. Chiheb et al., (2019) affirm that *“these latter have the potential to enhance the decision-making process, thus improve the quality of decisions and achieve a competitive advantage for organizations.”* Tang & Neave, (2020), consider for example, the document processing services based on machine learning provided by SAP Intelligent Technologies include a potent technology to identify and highlight any form of named item in unstructured text and classify it into specified categories. By doing this, this service contributes to an overall boost in productivity, efficiency, and error-free document processing. In audit, the improvements provided by Artificial Intelligence are more evident. Instead of discovering an error in a later stage, AI allows a continuous and in real-time audit where errors can be identified quickly. Najem et al., (2022) states that AI *“can help limit competition, enter a new market or launch a business”*.

While there is an increase in the number of companies investing in blockchain through cryptocurrencies, and intangible assets, accounting professionals must stay up to date on the digital currency market.

Basically, through those technologies, accounts are able to reduce the time executing unskilled tasks and focus its knowledge and time on interpreting data, providing a better customer and strategic service and being more analytical and forward-looking (ICAEW, 2022). Existing digital-age technologies improve accountants' work in terms of speed in the procedures of registering and transferring information from companies with quality and security, boosting the transparency and credibility of the services given. It is unanimous between the authors that emerging technologies free accountants of doing repetitive and rule-based tasks allowing them to concentrate on analysis and strategic consulting activities based on real-time business intelligence, moving accounting functions up the value chain in organizations. Through the survey I aim to know how the volunteers evaluate the benefits of emerging technologies in their daily activities and with interviews I aim to hear their experiences regarding it.

2.4 Adaptability and new skills

Acemoglu & Restrepo, (2019, 4), remember that the accountant, previously seen only as a bookkeeper, performed an operational function such as issuing invoices or generating accounting reports. With the evolution of emerging technologies and automation of several activities, other technological developments generated employment opportunities in new occupations. And Nagarajah, (2016) adds that all this evolution required accountants to be open to innovation and develop new tasks and skills. It means that accountants should be

skilling upwards to negate the risks of obsolescence.

Technological advancements have enhanced the accountant's ability to interpret data efficiently and effectively (Pepe, 2011) adding value for the business. Accountants are therefore moving away from bookkeeping and stewardship to become strategic business partners (Pepe, 2011). For James Poyser, CEO of Provostor, a good accountant does not mean being good at math, but digital skills become a significant focus (TalentLMS, n.d.). Accountants now have to have a high level of computer and technical skills. Understanding and knowing how to extract useful information from the various existing technologies is essential in the accountant's role. The information generated by systems must be analysed by a professional, making the accountant professional perform the role of consultant and adviser. These skills have become part of the knowledge, and abilities of the accounting professionals (Pepe, 2011).

With opportunity often comes risk, so overcoming challenges associated with technology was also discussed (Skoulding, 2018). Some research suggested that approximately half jobs are susceptible to automation and the accounting sector is on the top of the list. According to Osmani et al., (2020, 108) online or cloud-based accounting software is enabling small companies to do bookkeeping tasks themselves thereby significantly reducing costs and employability.

However, Kaplan Financial Limited (2020) says that *"what we see is that as the use of automation grows, employers are looking for top talent that can do what the robots can't"*. New skills are required from accountants such as strategic thinking, addressing sustainability, supporting innovation and driving the digital agenda (ACCA, n.d.). Soft skills such as communication, teamwork, leadership and creativity are essential in an accountant's career as hard skills and qualifications. Kirstin Gillon, technical manager at ICAEW's IT Faculty, suggests in a report that important skills for accountants will be working across functions, communication and working with others. The qualifications required to be an accountant also leads to a more analytical role. Having a good understanding of basic accounting, analytical and cognitive skills are necessary.

On Indeed website there is a list of essential skills required to have a successful career in the field of accounting. Between them, computer programming is listed as one of the accountant's skills required nowadays. Familiarity with programming languages such as Structured Query Language (SQL) and Python can give you a much-needed edge over others in your profession – making you more likely to land the job of your dreams (Indeed, 2022).

According to Wann, (2022), the challenges faced by accounting professionals due to the increased use of technologies are the regulation changes and complexity, globalization and cybercrimes as well as changes in the role and shortage of qualified professionals and.

ACCA in one of its Student e-magazine says that cyber security is also a new role for

accountants. They suggest that, as data is distributed in different systems and technologies, it is more susceptible to cyber-attack. Berriman (n.d.) therefore says that, *“Accountants, both in practice and in industry, must therefore understand how to identify and respond to cyber security risks, rather than ignore the issue in the belief that cyber security is the domain of their IT departments or that their organisation’s software will prevent any breaches”*.

There is a consensus among authors that accounting professionals must be open to innovation and upskill themselves to stay on top. Thus, I will ask my interviewers how they see these changes and how they adapt and keep up to date with it.

2.5 What is the future of accounting professionals?

With the exponential growth in the use of artificial intelligence, blockchain, cloud and big data, more accurate decisions are made, with fewer errors, avoiding fraud and reducing bureaucracy. Digital accounting unites accountants and machines and allows each party to do its work in the area of its ability.

As RPA is spread around business, accounting firms need to find new services to offer and create competitive advantage over its competitors. Törnqvist & Forss (2018) suggests that this service could be a consulting and analytical service, so there was a common perception that even more jobs will be available. Kaya et al., (2019, 244) point that RPA is not replacing accountants; it evolves their job in a progressive, and positive way. The changes in accounting caused by the industrial revolution are unstoppable, and organizations and professions must be prepared to adapt and evolve with it. The three changes—evolving smart and digital technology, continued globalization of reporting/disclosure standards, and new forms of regulation—are also major challenges for the profession (ISLAM, 2017).

While professionals may feel these technologies as a threat, they actually create many opportunities (Kroon, et al., 2021). Tang & Neave, (2020), believes that raw data is useless for making decisions, thus deep insight and expertise provided by human accountant’s aids in corporate planning is still indispensable. No type of AI at this time can understand how quantitative data connects to a company's distinctive structure and operations and then offer qualitative recommendations that consider changing business situations, requirements, and objectives.

New technologies will continue to be developed, smart software systems, the use of social media as tools to improve engagement and collect data. Some of the existing accounting roles will expand due to the increase in collaboration and partnership with other parts of the organisation (Todorova, 2018). Huerta and Jensen (2017, 105) view data analytics as an "opportunity for accountants to move from the role of watchdog within an organization to being a business partner," playing a strategic role by assisting their enterprises in becoming more

data-driven. Tang & Neave, 2020 address that AI will change the tasks that a human accountant performs, as opposed to replacing them. Accounts will be more evolved in more strategic roles and management functions and accountant professionals must be open and curious about innovation and flexible to interact finance and technology skill helping on strategic management, decision-making and problem solving. A truly cutting-edge professional with a broad skill set that includes technical prowess, technological savvy, excellent communication skills, untouchable ethics, commercial acumen, a focus on sustainability and governance advocacy (Johnson, 2021).

Within accounting, the auditing area has also been growing and standing out. The audit conveys the company's credibility to its stakeholders. This area is increasingly linked to technologies and the advantages of the security, volume and speed that it offers. The Big Four Accounting Firms - Deloitte, PwC, Ernst & Young and KPMG, have invested massively on Artificial Intelligence and Blockchain to improve its services, add-value to its business and create competitive advantage. Examinations of the use of BG, ML, and AI technologies by the Big Four accounting firms reveal two common trends. First, the accounting profession is increasingly investing in AI and its integration into core business; second, the Big Four claim that AI is a key factor for future success in the accounting field (Zhang, et al., 2020).

Bonyuet (2020) theorize that, as blockchain systems are standardized across sectors, some potential new positions for accountants (auditors) include: auditor of smart contracts and oracles, service auditor of consortium blockchains, administrator function, and arbitration function.

There is little question that financial robots will eventually replace people in fundamental accounting activities, since they are currently an essential part of the accounting landscape. To execute progressively difficult jobs as a financial practitioner, it is critical to consistently increase one's professional knowledge and abilities, including computer proficiency. Simultaneously, education institutions must adapt appropriately by embracing a higher degree of technological expertise. This means that the career and role of an accountant is constantly evolving and growing. Although the roles have changed, the options and opportunities for a successful career in the accounting field are endless. Along with that I aim to hear from the respondents their expectations about the future of the profession.

CHAPTER III

Emerging technologies in accounting: a threat or an opportunity for the accounting profession?

Methodology

3.1 Introduction

This chapter seeks to convey the importance of the study's philosophy, approach, and methodologies.

3.2 Theoretical paradigm

As different people of different cultural backgrounds, under different circumstances and at different times make different meanings, and so create and experience different social realities, interpretivists are critical of the positivist attempts to discover definite, universal 'laws' that apply to everybody. (Saunders et al., 2019, 149)

Based on the above statement, and considering the five research philosophies in business, the most appropriate approach in this research is Interpretivist. This point of view seemed relevant to analyse the phenomenon as the study sought to understand the different narratives, experiences and perspectives by gathering data that is important to the research participant.

3.2 Research Method

The research method used in this project is interpretivist. As it applies to mixed methods of research, followed by the inductive method, which states that social reality is influenced by social situations and human experiences rather than being unique or objective (Alharahsheh & Pius, 2020, 42).

Due to the nature of the research, which called for an interdisciplinary approach, and the preoccupation with an absolute and comprehensive grasp of the matter, it was seen as mixed approaches. The method was employed to advance knowledge by analysing and interpreting the collected data.

3.3 Research Approach

The research includes three qualitative interviews, and an online survey with 52 respondents. Through the interview the goal is to gain a broader understanding of opinions, experiences and expectations of the participants. While through survey it aims to achieve the representativeness of the population.

3.4 Research Process

Interview participants were invited to participate via email or text messages. The quantitative research (survey) was carried out through Google Forms and disseminated online through groups of professionals in the area and their colleagues.

Due to the incompatibility of the agenda, some of the professionals interviewed preferred to participate via email. Other invited interviewees did not respond or were not available to attend an interview. At the same time, interviews and surveys were being shared and data was being collected.

In both cases a brief presentation of the study was made and consent was requested.

3.6 Sampling

Sampling, the process of choosing a section of a whole that is typical of it, is a crucial phase in the research process because it influences the validity of the inferences the researcher draws from the underlying data. Sampling is categorized in two classes: probability or random sampling - usually associated with quantitative research; and purposive or non-probability - usually linked with qualitative research.

There are a couple of similarities between purposive and probability sampling: They both are designed to provide a sample that will answer the research questions under investigation, and they both are concerned with issues of generalizability to an external context or population (i.e., transferability or external validity). (Teddlie & Yu, 2007, 84)

By combining these two classes, researchers can create supplementary databases that provide data on the phenomenon under research that is both deep and broad.

This study adopted Mixed Methods sampling strategies to improve theoretical understanding, continuity, increased validity, and offers rectification in the event of discrepancies in results. The sample chosen was professionals working in the accounting area. Most professionals work in medium and large companies and have extensive experience in the accounting field.

3.7 Data Analysis

This research used mixed methods of research aiming to gain an understanding of the impacts of technology in the accounting field. With the objective of obtaining general and valid external insights from quantitative data, as well as specific and circumstantial insights from qualitative data.

Mixed analysis involves the use of both quantitative and qualitative analytical techniques within the same framework, which is guided either a priori, posteriori, or iteratively. (Onwuegbuzie & Combs, 2011, 3)

This research uses two research components, current and independent. This means that the qualitative and quantitative research had both been collected and data analyses were made simultaneously. One research does not influence the outcome of the other.

After data collection, an analysis was carried out to triangulate the information from literature review and primary research. In the next chapter, the themes and its findings will be addressed separately to provide an easier understanding and to help answer the research question.

3.8 Ethical Considerations

When doing the preliminary research for this work, appropriate moral standards and project-related ethical considerations were applied. The proposed method as a whole was designed to guarantee an accurate and trustworthy collection of data, eliminating any possibility of bias or researcher influence. This relates to the sampling used for the questionnaire and interview data validity.

The participants' support was fully voluntary and strictly private. Both, the interview participants and the questionnaire respondents, were made aware of the confidentiality of their personal data. An explanation of the study's procedures and goals, as stated in Appendix I, was given along with consent. All identifiable information about the volunteers was withheld in order to preserve their privacy. In this work, they were referred to as "participants" or "interviewees".

CHAPTER IV

Emerging technologies in accounting: a threat or an opportunity for the accounting profession?

Analysis and Discussion of Findings

4.1 Introduction

In this chapter, the evidence gathered during the research is marked with the purpose of providing a thorough analysis of the results and transforming them into effective knowledge. The conclusions of the primary study's findings will be examined in relation to various aspects of the literature review.

Three people were interviewed for this project, two are in Brazil and one in Ireland, as shown in the table below.

Table 1 - Interviewees

Interviewee 1	Lives in Curitiba - Brazil. Has more than 20 years of experience in the accounting sector. He is a Senior Tax Analyst in the second biggest Brazilian cosmetic company.
Interviewee 2	Lives in Dublin and has eight years of auditing experience. She is Auditor Analyst in a large bank in Ireland.
Interviewee 3	Lives in Sao Jose dos Pinhais - Brazil. Has almost 10 years in the accounting field. She is tax analyst in a global tire and rubber company.

The survey's respondents were the majority residing in Ireland and working for medium/large companies in different roles, as shown in the charts below.

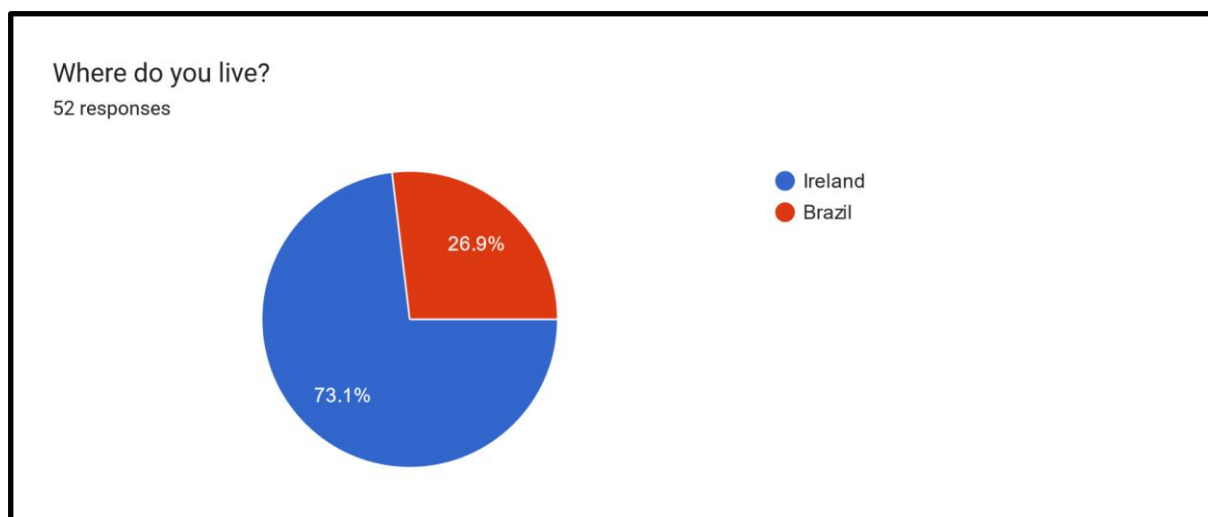


Figure 1- Where do you live?

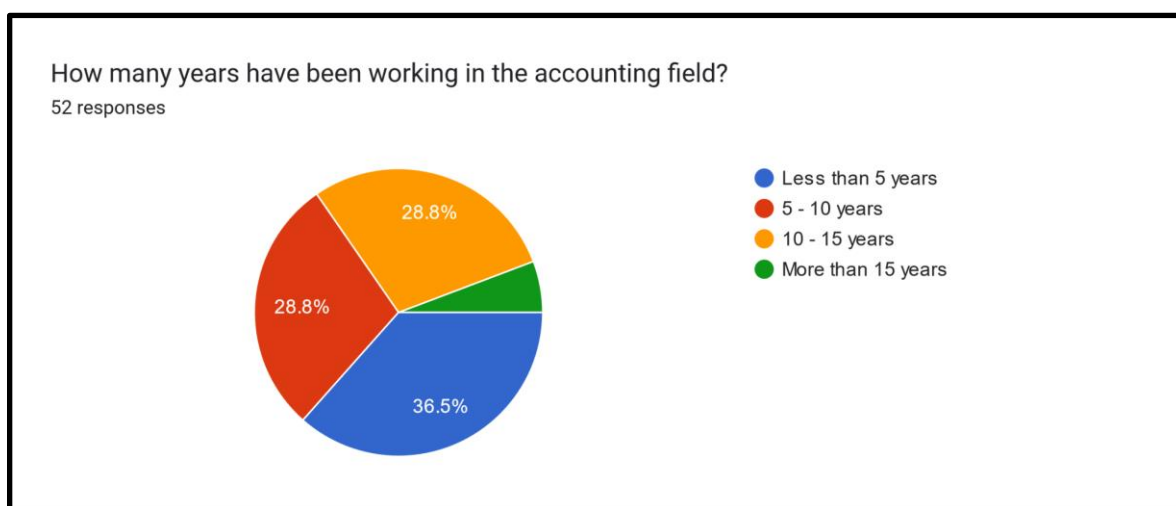


Figure 2 - How many years have you been working in the accounting field?

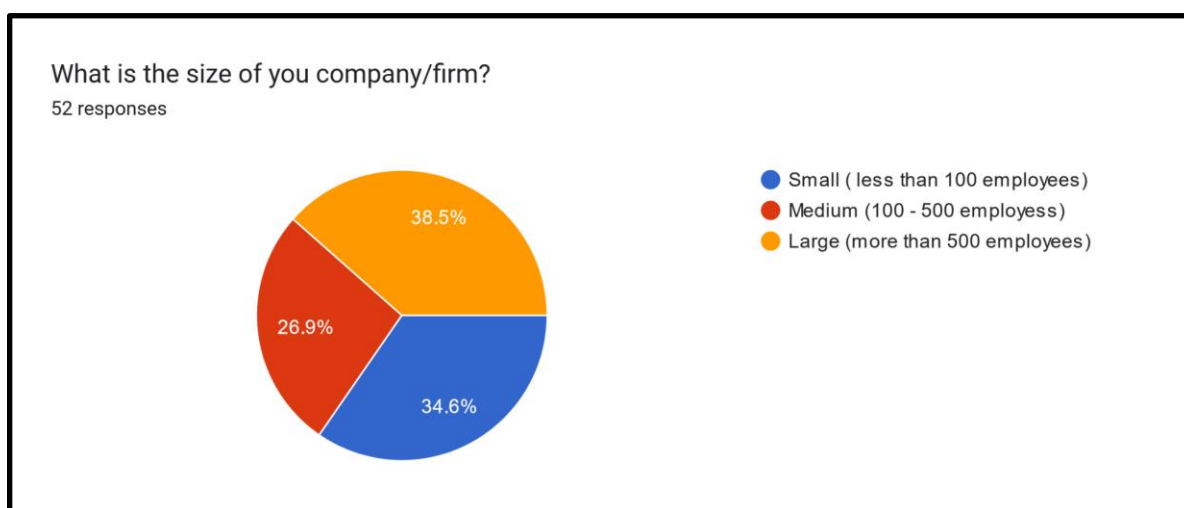


Figure 3 - What is the size of your company?

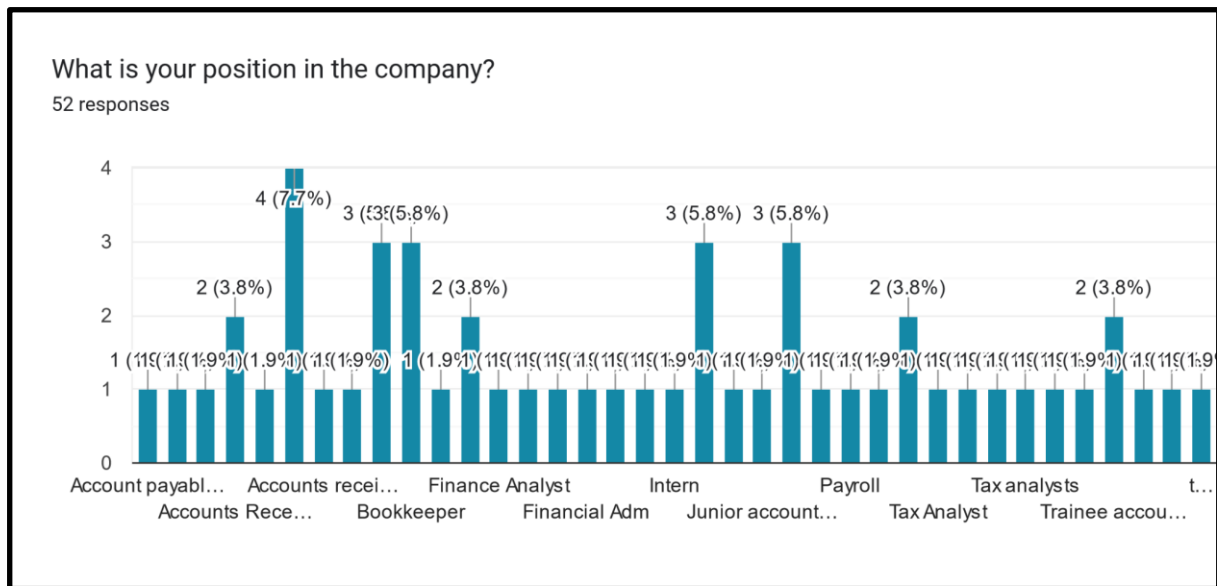


Figure 4 - What is your position in the company?

4.2 Emerging Technologies in Accounting

This first theme examines the technologies currently used in accounting.

Emerging technologies are spread around the world and more present in our daily lives than we sometimes imagine. In the accounting area, it is essential in the development of daily activities. Gustafsson & Jerking (2021) mentioned four technologies present in the sector: Artificial Intelligence, Big Data, Cloud Accounting and Blockchain. Another technology that came up countless times in research is RPA - Robotic Process Automation. Along with that, Kaya et al. (2019), added that the robotic software eliminates the human dependency by freeing human employees from these routine tasks to give a chance to focus on core business objectives and operations. The presence of these technologies was confirmed by the interviewees and the survey respondents, as shown below.

“As most of our processes are online, automation is widely used here. Big Data is also a technology that I use a lot, as we need data as quickly as possible. Most of the data is in the cloud and can be accessed from anywhere, as you can see I am still working from home. This grew a lot during the pandemic. Artificial intelligence is also present.” Interviewee 1

“Among others, Computer automated systems, financial accounting system, payroll system, inventory control system, Big Data, AI and so on.” Interviewee 2

“In my company, we use all the technologies cited, but in my sector, automation and big data are definitely the most used.” Interviewee 3

In the survey, volunteers were from Ireland invited to select two technologies most used by their companies. Among the 52 responses received, 43 cited Big Data as the most used technology followed by RPA with 25 responses. Artificial Intelligence and Blockchain were also represented with 17 and 9 votes respectively.

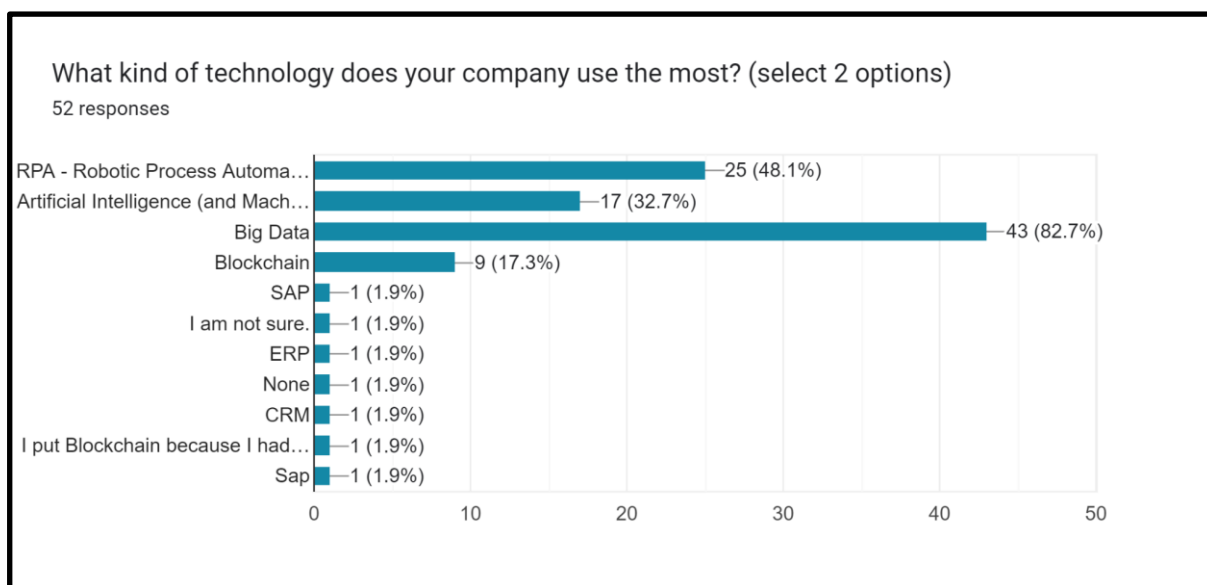


Figure 5 - What kind of technology does your company use the most?

Mordor Intelligence (2022) projected an increase of 30% in CAGR (Compound Annual Growth Rate) in Artificial Intelligence between 2022 and 2027 in the accounting field. Zhang, et al., (2020) considered that Big data is valuable as a source of financial data to support business decision-making. And PwC (2017), says that Big data enabled by cloud allows predictive relationships to form, underpinning optimisation. When questioned about the investments their companies are making in technologies, most of them are aware of their companies' technological investments.

“The company is always looking for technological innovations, whether by investing in cutting-edge technologies or associating with companies that have these technologies. Artificial intelligence is the technology in which we have invested the most.” Interviewee 1

“My company is investing massively in Facial Recognition and Blockchain.” Interviewee 2

“With the pandemic, my company had to invest a lot to minimize the effects of the lockdown. Investments in Cloud and AI are on the top” Interviewee 3

Of those surveyed, about 45% said they did not know the investments that their companies are seeking in the technological field while almost 55% of them are aware of it.

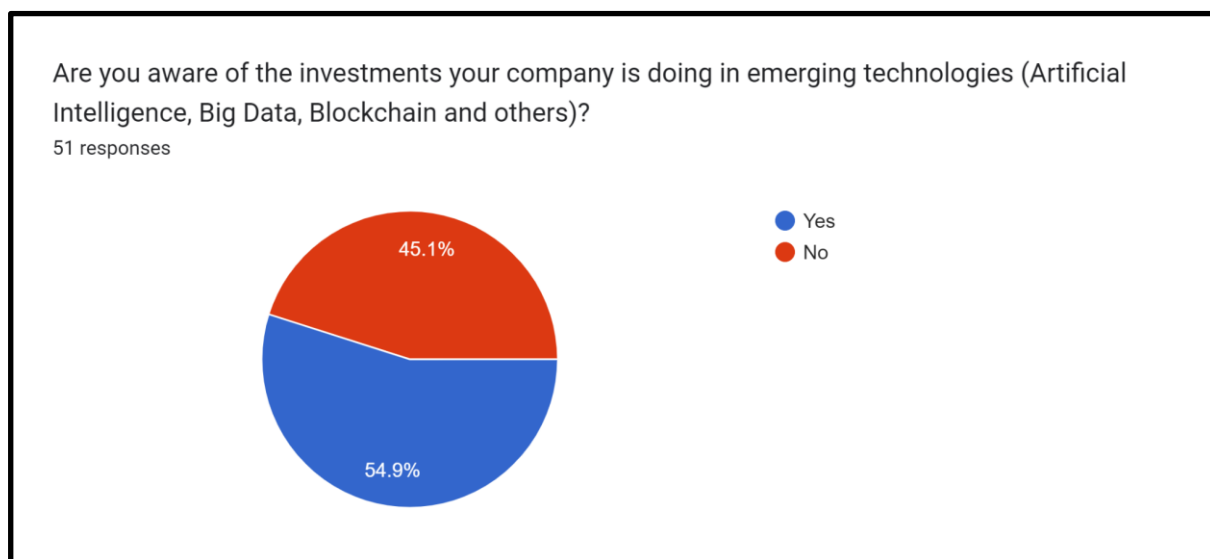


Figure 6 - Are you aware of the investments your company is doing in emerging technologies?

4.3 Benefits and improvements

Based on technologies present in the accountant's daily activities, this theme aimed to evaluate the benefits, and disadvantages if any, and improvements that it brings to the accountant's role.

During the literature review research, authors were unanimous in saying that technology added value to the accounting professional by getting rid of repetitive and ruled based activities. The Institute of Chartered Accountants in England and Wales - ICAEW (2022), in one of their insights, affirm that through emerging technologies accounts are able to reduce the time executing unskilled tasks and focus its knowledge and time on interpreting data. When questioned about it, both interviewees agreed with the affirmation above and concur that their activities are analytical.

"Definitely yes. Now the accountant occupies a more analytical, consultative position instead of just being the bookkeeper." **Interviewee 1**

"I believe so. The profession is more valued today due to the professional skills required, such as interpreting data analysis." **Interviewee 2**

"I think that the profession has become more strategic, but I think that many companies still value it as they should." **Interviewee 3**

The survey complemented it when more than 90% of respondents "totally agreed" or "Agree"

with the information that the emerging technologies added value to the accounting professionals. There were no respondents disagreeing with the statement.

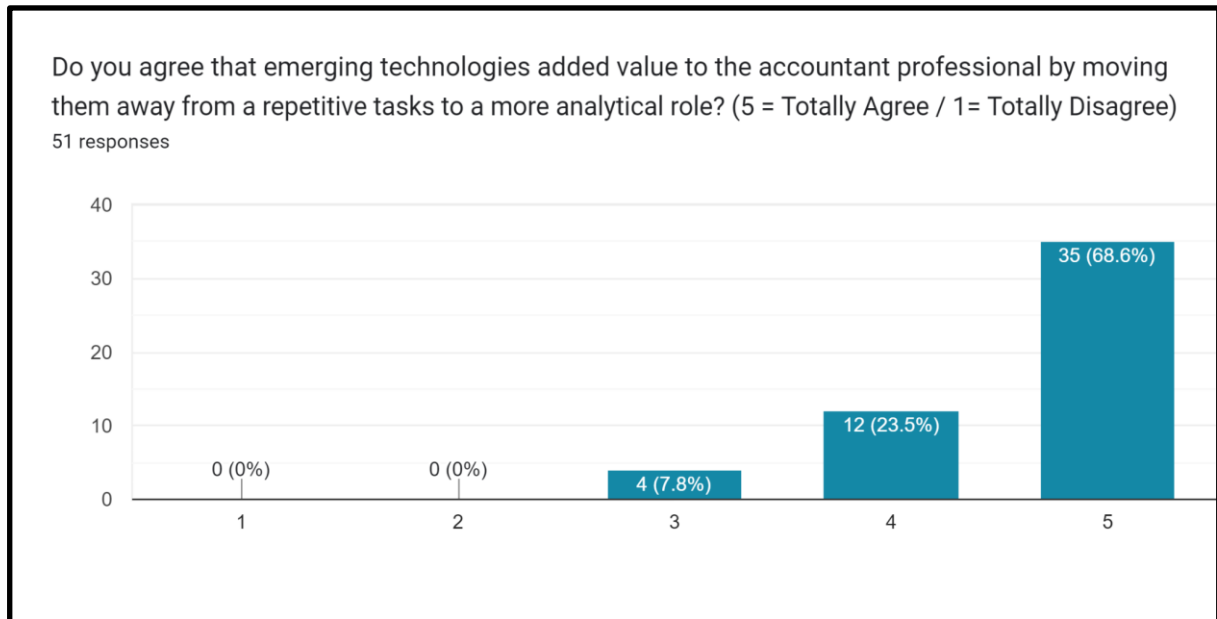


Figure 7- Do you agree that emerging technologies add value to the accounting profession by moving them away from a repetitive task to a more analytical role?

Regarding the improvements, Deloitte (n.d) cited some as flexibility and scalability, improved accuracy, add-value, allows time to innovate and focus on customer satisfaction. Kaya et al., (2019, 240) added that it can run 24x7x365 error-free and 25-50% less cost. The reasons for investing in technologies, according to the interviewees, confirm that it increases efficiency and accuracy.

“When a company uses technology in the workplace, it gains many benefits, including: Enhanced communication techniques; Process integration; Accelerated financial services; Efficiency increase; Greater competitiveness in the market; Reliable data storage; Remote Working.” Interviewee 2

“Certainly, the fact that it is a competitive factor, makes you stand out in relation to your competitors, but the main factor is speed and the reduction of human errors. And with the information in hands, we can make better and more assertive decisions.” Interviewee 1

“Certainly, agility and precision in information processing are the main factors, as it contributes to improving the company's performance.” Interviewee 3

Among the survey respondents, 41 of 52 respondents agree with Kaya et al that accuracy and time-saving is the main reason, followed by creating competitive advantage over its

competitors, with 20 responses.

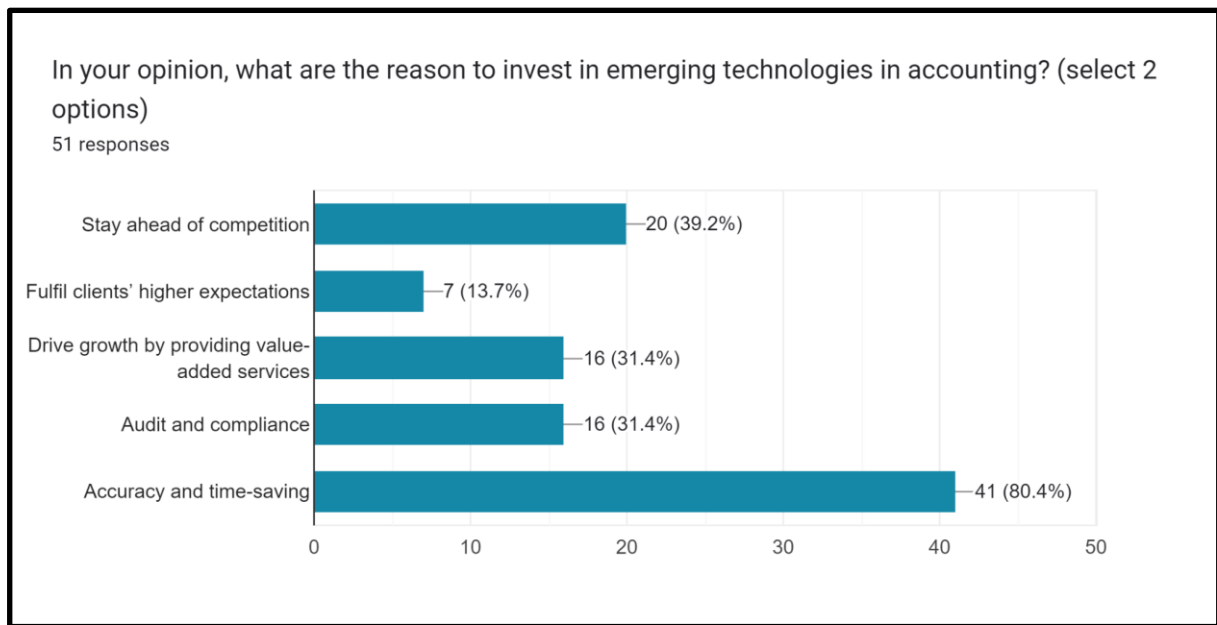


Figure 8 - What are the reasons to invest in emerging technologies?

According to ICAEW (2017, p. 8), accountants can benefit from the intelligent systems as by using their capabilities they will be able to solve three broad problems: support decision-making by providing better and cheaper data; provide more profound analysis of data and give new insights on business. In the survey, volunteers were questioned if they see improvements in their daily routine by the use of emerging technology. 62,7% of the 52 responses “Totally agree” with that while only three volunteers “disagree” or “totally disagree” with that. Around 6% did not know how to evaluate it.

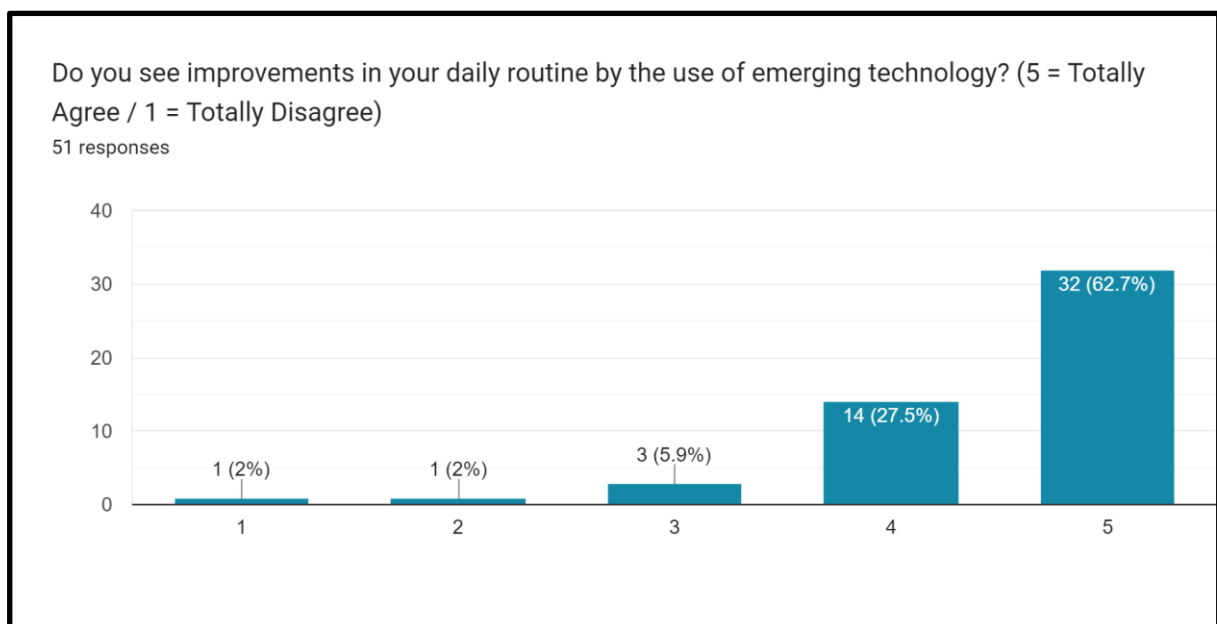


Figure 9 - Do you see improvements in your daily routine by the use of emerging technologies?

The interviewees also agreed that the use of technologies improved their activities, especially

regarding the decision making and benefit business.

“In today's world, having information in real time is much more important than having accurate information too late. With the information in hand, we can make better and more assertive decisions. Another important fact is the immediate detection of errors, avoiding losses and rework.” Interviewee 1

“The company is investing in blockchain for information recording systems in order to reduce the risk of internal fraud by making it difficult or impossible to alter, hack, or trick the system, thus improving data management security.” Interviewee 2

However, Gardner and Bryson (2020) suggests that “perhaps always a darker side to innovation; innovation simultaneously destroys and creates tasks/jobs. Most of the interviewees disagree.

“I don't see a downside. The world is changing, and we need to change too. There are many opportunities; we just have to be willing to adapt. “Interviewee 1

“I don't see a dark side; I see more opportunities.” Interviewee 2

“The downside is that there's always something new, and it's hard sometimes to keep up with it all.” Interviewee 3

In the survey, volunteers were questioned if they observed changes in employability due to new technologies. Only three respondents (5,9%) affirmed that they observed layoffs or fewer jobs, while 60,6% of them have observed lots of opportunities in the accounting field. 23,5% did not know how to evaluate it or did not observe changes in the market.

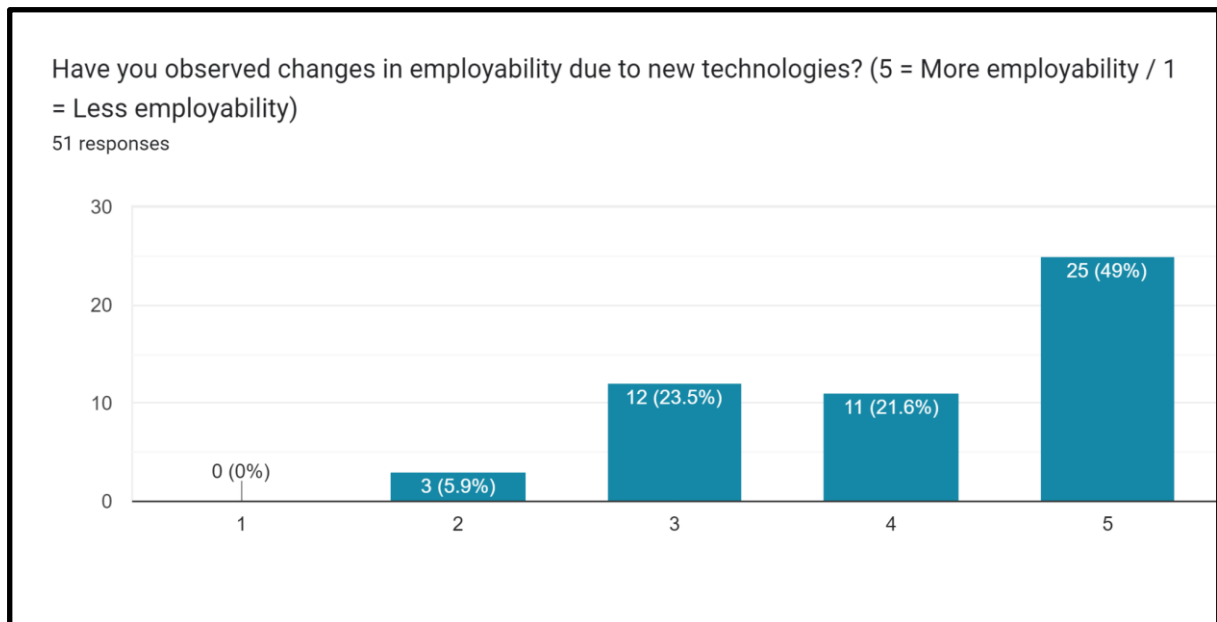


Figure 10 - Have you observed changes in employability due to new technologies?

Based on the responses, it is possible to state that the benefits of emerging technologies in the accounting area outweigh the disadvantages, since they are minimal or non-existent. Both respondents state that they trust the processes and data generated by emerging technologies.

4.4 Adaptability and new Skills

In the literature review Acemoglu & Restrepo, (2019, 4), remember that the accountant, previously seen only as a bookkeeper, performed an operational function such as issuing invoices or generating accounting reports and with the technological advancement accountants had to adapt.

"We definitely have to adapt to technological changes or we will become obsolete."

Interviewee 1

"Given the constant evolution of technology, we always must adapt to new systems and procedures, and it is part of the process."

Interviewee 2

"You have to be flexible and willing to adapt in order to grow in your career."

Interviewee 3

Nagarajah (2016) suggested that accounting professionals must update and upskill themselves in order to follow the technologies and not be left behind. Several websites and researches endorsed the idea that accountants must adapt to technological advancements and that new skills are essential for accountant's professionals. The global body for

professional accountants (ACCA), advise in their blog that new skills are required from accountants such as strategic thinking, addressing sustainability, supporting innovation and driving the digital agenda.

In the survey, volunteers were invited to rank the 3 most accountant's required skills nowadays. In the respondent's opinion, technical skills are the most required skills, followed by strategic thinking and communication skills. Digital skills and team work were also mentioned. Thus, the surveyor's response supports the literature review when, Kirstin Gillon, technical manager at ICAEW's IT Faculty, says that important skills for accountants will be working across functions, communication and working with others.

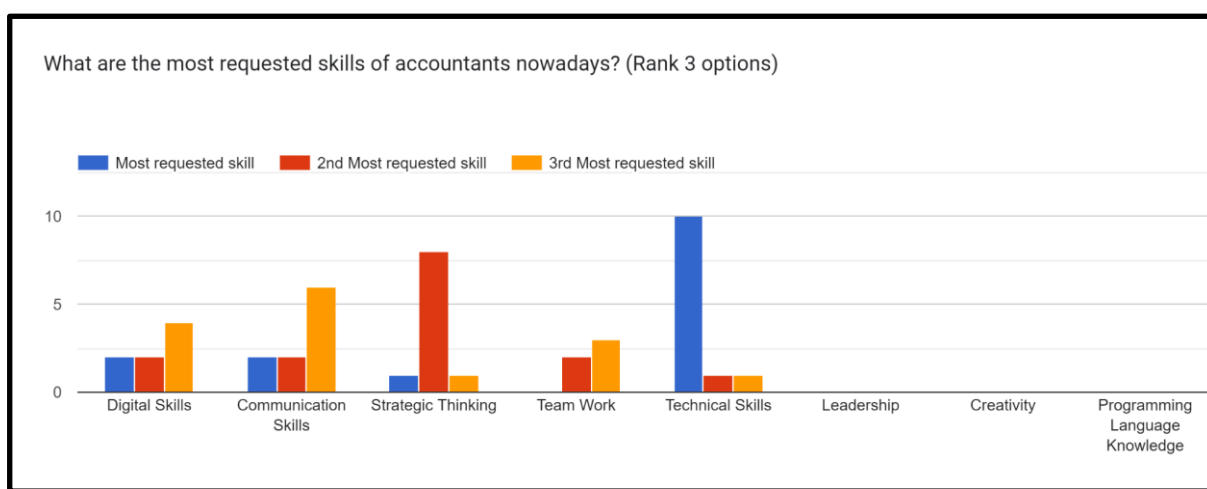


Figure 11- What are the most requested skills of accountants nowadays?

The interviewees confirm that technical skill and strategic thinking are the main skills required along with softs skills. Kaplan Financial Limited (2020) says that *“what we see is that as the use of automation grows, employers are looking for top talent that can do what the robots can’t.*

“It is necessary to have technical knowledge of the area and also analytical knowledge. Knowing how to extract critical information for the company is as important as knowing how to communicate and work in a group.” Interviewee 1

“Full Qualification in an accept account body, financial statement preparation capability, technology skills, computer skills, numerical and analytical skills, business awareness and Communications skills.” Interviewee 2

“Technical knowledge and teamwork are essential in daily activities.” Interviewee 3

Wann, (2022), adverts that the challenges faced by accounting professionals nowadays, due to the increased use of technologies, are the regulation changes and complexity, globalization

and cybercrimes as well as changes in the role and shortage of qualified professionals. This is endorsed by the interviewees and also supports the statement presented in the literature review where ACCA affirm that accountants must be concerned about cyber security, knowing how to identify and respond to it.

“With new technologies we may expose the company to new security threats and cyber risks.” Interviewee 2

“There are many technologies and many systems, and it is not always easy to keep them up to date. There are many internal and external regulations, and the transition process is often complex. Privacy and cybercrime are factors that we must be very careful about.” Interviewee 1

To try to understand how accounting professionals overcame the challenges and adapt to constant technological advancements, they were asked about training or other ways to upskill themselves. The interviewees said that their companies frequently offer them training, since they are required by controlling bodies. However, regarding IT courses it is not mandatory training, unless a new system is implemented in the sector.

“...the regulatory body requires the company to provide monthly training and awareness about the business in which it operates. However, IT courses are not frequent” Interviewee 2

“I’m always in search of knowledge, and here at the company they always offer training, especially because laws and regulations are always changing. We also have access to study platforms, but they are for extra-curricular courses. We are not obligated to do so.” Interviewee 1

At the same time, the same question was asked to the surveyors. Nearly 75% of the responses declared that their companies rarely or occasionally provide training regarding new technologies. Only 23,5% affirm that training is frequently provided.

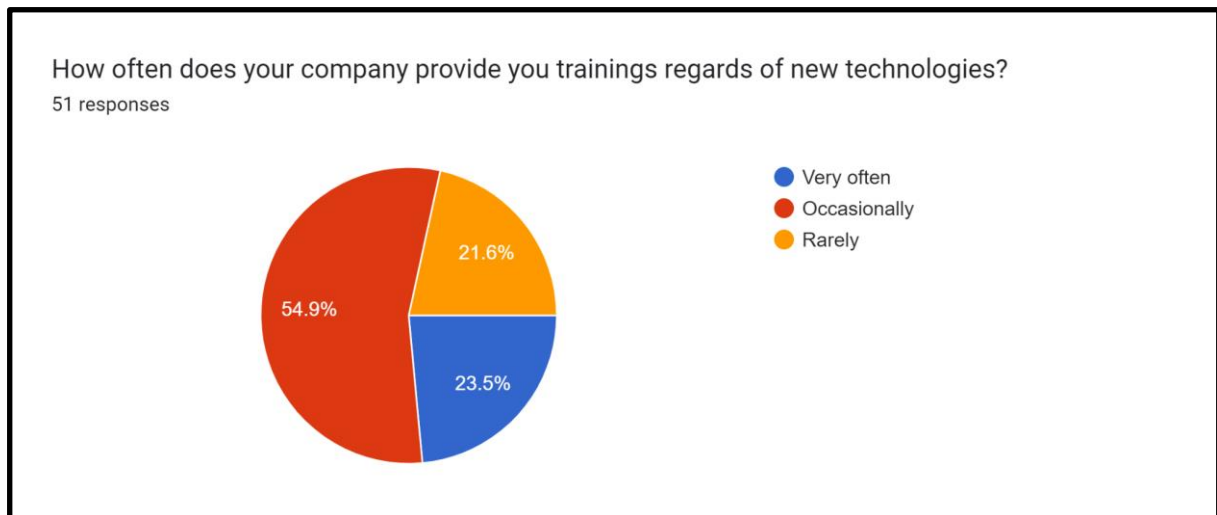


Figure 12 - How often does your company provide you trainings regards of new technologies?

In both cases, survey and interview, they were asked about how they upskill themselves. Almost 30% of the survey respondents declared that they are not preparing for technological innovations in accounting while most people answered that they are preparing themselves for innovations through online courses and workshops. Two respondents announced that they are learning programming languages, backing the belief presented in the primary research by Indeed (2022) that “familiarity with programming languages such as Structured Query Language (SQL) and Python can give you a much-needed edge over others in your profession – making you more likely to land the job of your dreams.”

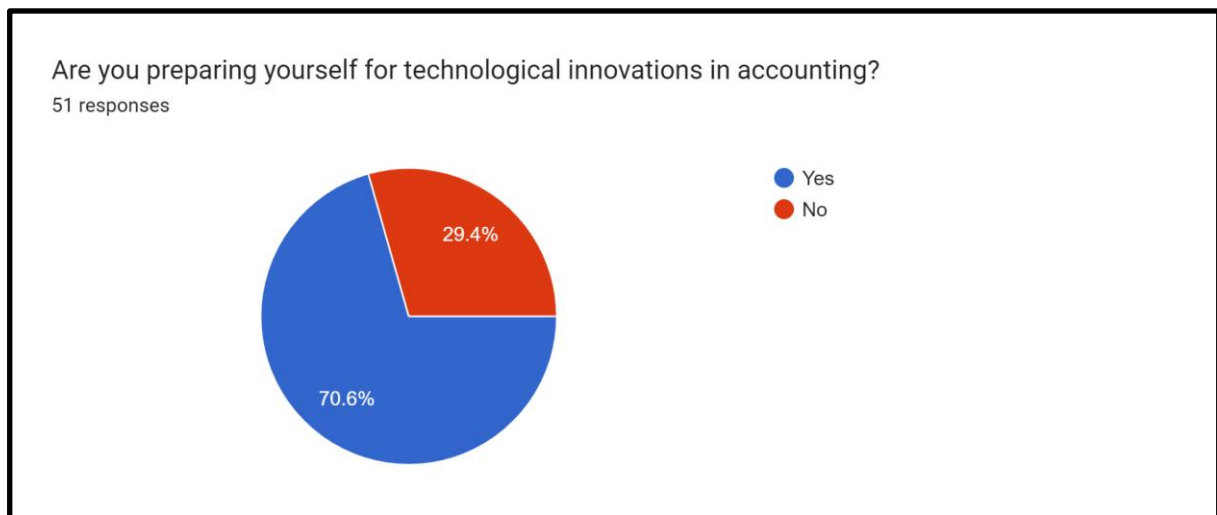


Figure 13 - Are you preparing yourself for technological innovations in accounting?

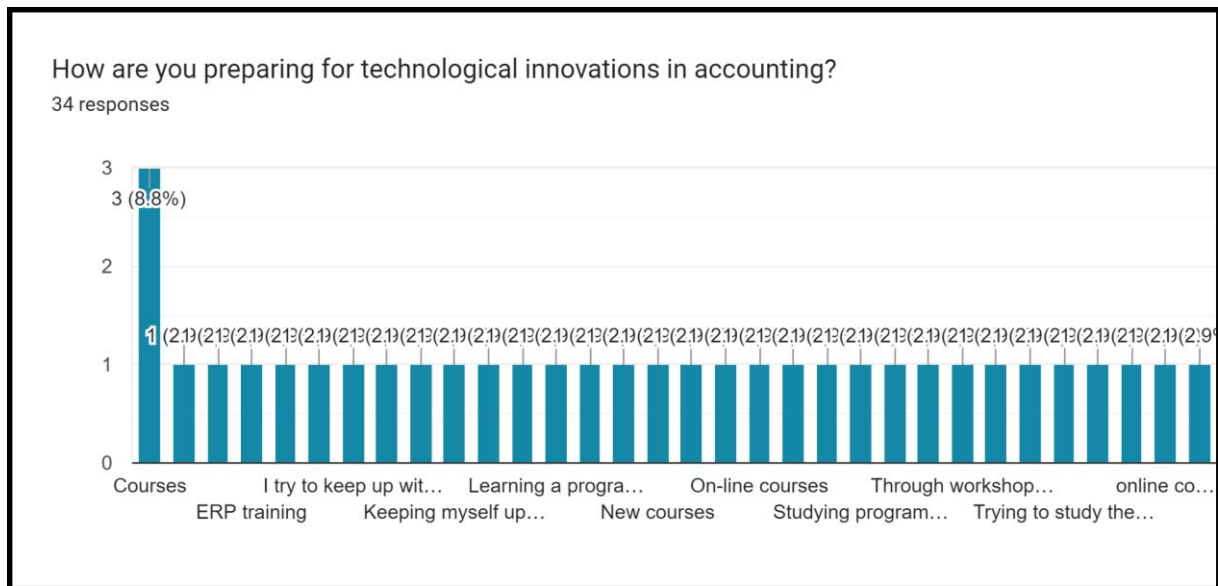


Figure 14 - How are you preparing for technological innovations in accounting?

This theme provided a better understanding of how accountants professionals are adapting and dealing with technological advancements and how important it is to keep updated to trends and innovations. It supports the idea that there are lots of opportunities for those open to innovations and willing to adapt.

4.5 What is the future of accounting professionals?

The COVID-19 Pandemic accelerated several trends in the accounting field. Since remote work to the presence in social media, accountancy practices have changed a lot.

A few years ago, rumours that the robots would replace humans in fundamental accounting activities were very common. Today these directions are demystified. Kaya et al., (2019, 244) suggests that RPA is not replacing accountants; it evolves their job in a progressive and positive way. All of the interviewees agree with what was found in the literature review.

"Technology will continue to be an important consideration and will affect accountants' jobs more and more. Despite the fact that many accounting duties are now automated, technology will never completely replace accounting personnel." **Interviewee 2**

"The profession has changed a lot, so I believe that a lot will still happen. I think the profession will not end, but it is becoming increasingly indispensable because it deals with vital parts of companies. Being qualified, expert in the area will be paramount." **Interviewee 1**

"Accountants are a vital part of the company, and no robot can replace the human touch and the connections necessary in the business." **Interviewee 3**

Islam (2017) believes that changes evolving the accounting profession will continue with globalization of reporting/disclosure standards, and new forms of regulation. The second interviewee reinforced the idea above and pointed several times during the interview to the requirements and legislation in this field.

“With globalization and increasing standards and regulations, more qualified professionals are needed to meet this demand. ” ...Auditors will need a wider variety of abilities such as data analysis and digital technology to play a bigger role in the audit process...” Interviewee 2

Tang & Neave, (2020), believes that raw data is useless for making decisions, thus deep insight and expertise provided by human accountant's aids in corporate planning is still indispensable. When questioned about the future of the accounting profession, the interviewees are confident and in consonance with the literature review.

“There are many opportunities for growth in the area, especially for those with know-how and good understanding of accounting best practices.” Interviewee 3

“The profession will not end, but it is becoming increasingly indispensable as it deals with vital parts of companies. Being qualified and an expert in the area will be paramount.” Interviewee 1

The interviewee 2 bolster the perception of Zhang, et al., (2020) that AI is a key factor for future success in the accounting field and reinforce the data found in the literature review that Big Four companies are investing massively in this technology.

“Increased use of AI for auditing purposes, audit firms will also need a greater number of employees with significant experience in this technology, engineering, and mathematics.” Interviewee 2

The Interviewee 1 agree that accounting is a promising area saying that:

“There are many opportunities for those who are good, for those who are qualified, updated and willing to work. We often see a lack of skilled labour. So, the person needs to seek knowledge, specialise themselves and opportunities will not be lacking.” Interviewee 1

The perception raised by the Interviewee 1 also reaches the idea presented previously by Tang & Neave, (2020) where they say that accounts must be open and curious about innovation and flexible to interact finance and technology.

Bonyuet suggests that, as blockchain systems are standardised across sectors, some potential new positions for accountants, especially for auditors, may surge. The Interviewee 2 previously said that her company is investing massively in facial recognition and blockchain, evidencing the necessity of people with knowledge in this area. In the survey, volunteers were asked if they see a promising future for accountants, with new roles and more jobs or, less jobs and the field overpowered by robots. The respondents are majority in accordance with the literature review and the primary research and around 80% of the respondents “agree” or “totally agree” that more jobs and a bright future is expected for accounting professionals.

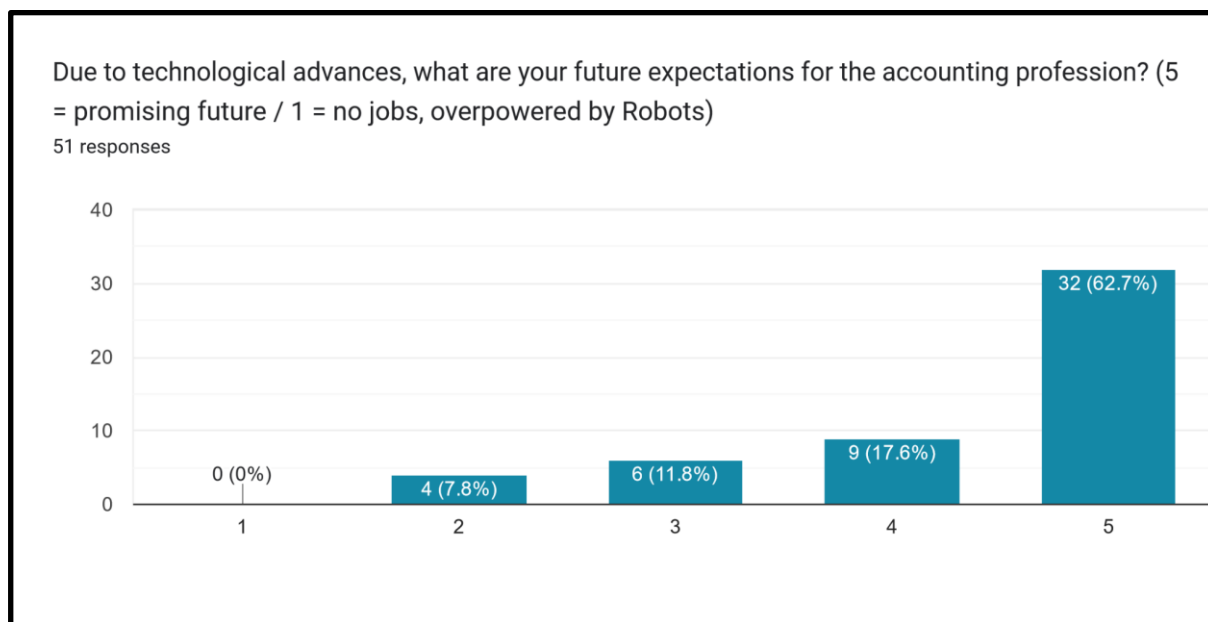


Figure 15 - What are you future expectations for the accounting profession?

Based on primary and secondary research, the optimism about the future of the profession is remarkable and corroborates with the literature review. Both agreed that the market is vast but requires flexibility and openness on the part of professionals.

4.6 NVivo Coding

A thematic analysis could be made using the main research's data collection. Thus, it was feasible to develop an NVivo theme in addition to enabling a more thorough analysis of the research. See table below:

Table 1 - NVivo coding

Emerging technologies in accounting: a threat or an opportunity for the accounting profession?

Thematic analysis of Qualitative Research	
Theme 1 - Question 1	CODES
Which emerging technologies are impacting the accounting sector?	(Theme 1)
What types of technology does your company use?	
Interviewee 1 - "As most of our processes are online, automation is widely used here. Big Data is also a technology that I use a lot, as we need data as quickly as possible. Most of the data is in the cloud and can be accessed from anywhere, as you can see I am still working from home. This grew a lot during the pandemic. Artificial intelligence is also present."	Automation, Big Data, Cloud, Artificial Intelligence
Interviewee 2 - "Among others, Computer automated systems, financial accounting system, payroll system, inventory control system, Big Data, AI and so on"	Automation, Big Data, Artificial Intelligence
Interviewee 3 - "In my company, we use all the technologies cited, but in my sector, automation and big data are definitely the most used."	Automation, Big Data
NVIVO Theme	Automation, Big Data, Artificial Intelligence
Theme 1 - Question 2	CODES
Which emerging technologies are impacting the accounting sector?	(Theme 1)
What are the main reasons that lead companies to invest in emerging technologies?	
Interviewee 1 - "Certainly the fact that it is a competitive factor, makes you stand out in relation to your competitors, but the main factor is speed and the reduction of human errors. And with the information in hands, we can make better and more assertive decisions."	Competitive advantage, integration, speed, reduction of human error
Interviewee 2 - "When a company uses technology in the workplace, it gains many benefits, including: Enhanced communication techniques; Process integration; Accelerated financial services; Efficiency increase; Greater competitiveness in the market; Reliable data storage; Remote Working."	communication techniques, integration, efficiency increase, competitiveness in the market, remote working, reliable data storage
Interviewee 3 - "Certainly, agility and precision in information processing are the main factors, as it contributes to improving the company's performance."	Better performance, speed, accuracy
NVIVO Theme	Accuracy, speed, competitive advantage
Theme 1 - Question 3	CODES
Which emerging technologies are impacting the accounting sector?	(Theme 1)
Are you aware of the investments your company is making (or intends to make) in new technologies?	
Interviewee 1 - "Artificial intelligence is the technology in which we have invested the most."	Artificial Intelligence
Interviewee 2 - "My company is investing massively in Facial Recognition and Blockchain."	Artificial Intelligence and Blockchain
Interviewee 3 - "With the pandemic, my company had to invest a lot to minimize the effects of the lockdown. Investments in Cloud and AI are on the top"	Cloud and Artificial Intelligence
NVIVO Theme	Artificial Intelligence
Theme 2 - Question 1	CODES
How emerging technologies have improved accountant's tasks?	(Theme 2)
Do you see improvements in the performance of activities due to the use of technologies? What kind of improvements? And what is the dark side of that?	
Interviewee 1 - "As most of our processes are online, automation is widely used here. Big Data is also a technology that I use a lot, as we need data as quickly as possible. Most of the data is in the cloud and can be accessed from anywhere, as you can see I am still working from home. This grew a lot during the pandemic. Artificial intelligence is also present."	Automation, Big Data, Cloud, Artificial Intelligence
Interviewee 2 - "Among others, Computer automated systems, financial accounting system, payroll system, inventory control system, Big Data, AI and so on"	Automation, Big Data, Artificial Intelligence
Interviewee 3 - "In my company, we use all the technologies cited, but in my sector, automation and big data are definitely the most used."	Automation, Big Data
NVIVO Theme	Automation, Big Data, Artificial Intelligence
Theme 2 - Question 2	CODES
How emerging technologies have improved accountant's tasks?	(Theme 2)
How do you rate the benefits of having real-time information?	
Interviewee 1 - "In today's world, having information in real time is much more important than having accurate information too late. With the information in hand, we can make better and more assertive decisions. Another important fact is the immediate detection of errors, avoiding losses and rework."	Enhance decision making, errors' detection
Interviewee 2 - "Take decisions as quickly as your business requires, increasing the flexibility and efficiency of business. For example in the company that I work we use dashboards collecting and managing real-time data. I don't see a dark side, I see more opportunities."	Enhance decision making, increase in efficiency
Interviewee 3 - "The main benefit is to have appropriate data during the decision making which contributes for better outcome."	Enhance decision making
NVIVO Theme	Enhance decision making
Theme 2 - Question 3	CODES
How emerging technologies have improved accountant's tasks?	(Theme 2)
Emerging technologies have added value to the accounting profession as they have taken accountants from repetitive and monotonous roles to more analytical and strategic roles. Do you agree with this statement? Why?	
Interviewee 1 - "Definitely yes. Now the accountant occupies a more analytical, consultative position instead of just being the bookkeeper."	Analytical role
Interviewee 2 - "I believe so. The profession is more valued today due to the professional skills required, such as interpreting data analysis."	Analytical role
Interviewee 3 - "I think that the profession has become more strategic, but I think that many companies still value it as they should."	Strategic role
NVIVO Theme	Analytical and strategic role
Theme 2 - Question 4	CODES
How emerging technologies have improved accountant's tasks?	(Theme 2)
Do you fully trust the information and results of technologies?	
Interviewee 1 - "I trust as long as the data is extracted and used correctly"	Trust in technology
Interviewee 2 - "Yes, I trust in the information totally generated by the system, however I do not trust in information entered manually as it can contain human errors."	Trust in technology
Interviewee 3 - "I trust. I think humans can make a lot of mistakes"	Trust in technology
NVIVO Theme	Trust in technology
Theme 2 - Question 5	CODES
How emerging technologies have improved accountant's tasks?	(Theme 2)
Have you observed changes in employability in the accounting area?	
Interviewee 1 - "I see many vacancies, but many vacancies that are difficult to fill. Today, the market is looking for highly qualified professionals but has not found any. Professionals with experience abroad are highly valued here."	Lots of job opportunities, high qualified staff
Interviewee 2 - "Yes, I have observed a hot market for accountants in Europe, as a result of the introduction of new IFRS and best practices standards, which require all companies to comply with extensive legislation, which necessitates the use of qualified professionals to carry out compliance obligations."	Hot Market, high qualified staff
Interviewee 3 - "There are many vacancies in the market in the accounting area, but the requirements are very high."	Lots of job opportunities, high qualified staff
NVIVO Theme	Lots of job opportunities, high qualified staff
Theme 3 - Question 1	CODES
What are the challenges of emerging technologies in the accountant's professional role and skills?	(Theme 3)
What are the challenges encountered in adapting to new technologies?	
Interviewee 1 - "There are many technologies and many systems, and it is not always easy to keep them up to date. There are many internal and external regulations, and the transition process is often complex. Privacy and cybersecurity are factors that we must be very careful about."	Many technologies and systems. Cyber crimes
Interviewee 2 - "Given the constant evolution of technology, we always must adapt to new systems and procedures and it is part of the process. With new technologies we may expose the company to new security threats and cyber risks."	New Systems and procedures and cybersecurity
Interviewee 3 - "The challenges are related to adapting to new systems and new technologies, especially for older people."	New Systems and technologies
NVIVO Theme	New Systems and procedures and cybersecurity
Theme 3 - Question 2	CODES
What are the challenges of emerging technologies in the accountant's professional role and skills?	(Theme 3)
Have you been keeping up to date? As? Does your company offer training in this area?	
Interviewee 1 - "I'm always in search of knowledge, and here at the company they always offer training, especially because laws and regulations are always changing. We also have access to study platforms, but they are for extra-curricular courses. We are not obligated to do so."	Extra-curricular courses
Interviewee 2 - "Yes, the regulatory body requires the company to provide monthly training and awareness about the business in which it operates. However, if courses are not frequent."	Training
Interviewee 3 - "I do not follow new technologies. My company only pays for courses when new systems are implemented"	Company rarely offer training
NVIVO Theme	Training
Theme 3 - Question 3	CODES
What are the challenges of emerging technologies in the accountant's professional role and skills?	(Theme 3)
What are the qualifications and skills an accountant must possess these days?	
Interviewee 1 - "It is necessary to have technical and analytical knowledge of the area. Knowing how to extract important information for the company, in addition to knowing how to communicate and knowing how to work in a group."	Technical and analytics skills
Interviewee 2 - "Full Qualification in an Accepted Account body, Financial Statement Preparation Capability, Technology Skills, Computer Skills, Numerical and Analytical Skills, Business Awareness and Communications skills."	Communication, analytical, technology skill
Interviewee 3 - "Technical and analytical expertise and teamwork"	Technical and analytical skill and teamwork
NVIVO Theme	Technical and analytics skills
Theme 4 - Question 1	CODES
What is the future of accounting professionals?	(Theme 4)
Do you think the roles of accounting professionals will change in the future? Which functions do you believe the accountant will have to incorporate and which will disappear?	
Interviewee 1 - "The profession has changed a lot, so I believe that a lot will still happen. I think the profession will not end, but it is becoming increasingly indispensable because it deals with vital parts of companies. Being qualified, expert in the area will be paramount."	Lots of changes, but won't disappear
Interviewee 2 - "Technology will continue to be an important consideration and will affect accountants' jobs more and more. Despite the fact that many accounting duties are now automated, technology will never completely replace accounting personnel."	Lots of changes, but won't disappear
Interviewee 3 - "Accountants are a vital part of the company, and no robot can replace the human touch and the connections necessary in the business."	Lots of changes, but won't disappear
NVIVO Theme	Lots of changes, but won't disappear
Theme 4 - Question 2	CODES
What is the future of accounting professionals?	(Theme 4)
Do you think Blockchain will be a trend in accounting? What knowledge do accountants and auditors need to acquire to be able to provide blockchain-based services?	
Interviewee 1 - "I don't know much about this technology, but like all the others, it's here to stay and will certainly bring innovations to the area. I know that my company is making investments in this area, but not in my industry. So we have to seek knowledge about this to offer the best to our customers."	Has no contact with this technology yet
Interviewee 2 - "Whether customers are seeking blockchain business prospects, implementing blockchain business applications, or utilizing blockchain in accounting, independent auditors will need to comprehend blockchain technology as it is applied at client sites."	Comprehend blockchain technology
Interviewee 3 - "It is a new technology and I do not have contact with it, but in order to give our customers the best service possible, we must learn more about this."	Has no contact with this technology yet
NVIVO Theme	Has no contact with this technology yet
Theme 4 - Question 3	CODES
What is the future of accounting professionals?	(Theme 4)
What are your expectations for the future in your profession?	
Interviewee 1 - "There are many opportunities for those who are good, for those who are qualified, updated, and willing to work. We often see a lack of skilled labor. So the person needs to seek knowledge and specialise so that opportunities will not be lacking."	Many opportunities
Interviewee 2 - "The COVID-19 completely changed the landscape of audit engagement, with the introduction of the remote work the Big Audit firms needed to invest in technology in order to maintain its business continuity. Auditors will need a wider variety of abilities such as data analysis and digital technology to play a bigger role in the audit process, and in order to efficiently use the increase use of AI for auditing purposes, audit firms will also need a greater number of employees with significant experience in this technology, engineering, and mathematics."	Many jobs will be available
Interviewee 3 - "I believe that the profession will be increasingly valued and will undergo some changes, so it is necessary to specialize."	Increasingly valued of the profession
NVIVO Theme	Opportunities/jobs

CHAPTER V

Emerging technologies in accounting: a threat or an opportunity for the accounting profession?

Conclusion, Limitations and Recommendations

5.1 Conclusion

Technology has an influence on almost every aspect of modern life, including productivity, social interaction, the accessibility of food and healthcare, and the safety and efficiency of transportation.

This study's goal was to learn more about how technologies are being used in the accounting industry and determine whether this poses a danger to the profession's future. When reading the literature, it becomes clear that not much is mentioned about the drawbacks or how this poses a risk to the profession. The literature review is supported by primary and secondary research. The respondents were adamant that new technologies are crucial for the accounting industry because they enhance the profession and propel accountants into more strategic and analytical roles inside the company. The time-saving and accuracy are the main but not the only benefits for accountants and for firms. It also save money and increase the efficiency and the quality of the work creating a competitive advantage over competitors.

Through the findings, it is feasible to affirm that emerging technologies are a great opportunity for accounting professionals and for those who are entering the industry now. However, it is essential to seed knowledge, and being open to innovation, curious about new trends, and also developing soft skills are key points for a successful career.

5.2 Limitations

Although the research was finished and its goals were met, there were certain obstacles to overcome. The limitations of this study regard to breadth of topic. It is easy to assure that technology is part of the accountant's profession, but it was difficult to find writers that match with the prosed study, formulate appropriate questions and for the interviewees to know and define what technology is behind the systems they use.

Another limitation was related to the interactions with interviewees. Some professionals were willing to give an interview, but due to the incompatibility of agenda and issues such as time zones, it did not take place. I did not feel comfortable insisting several times as participation

should be voluntary. Therefore, of the five guests, only three could be interviewed.

Ultimately, the whole project was challenging once to manage the importance of the other subjects, assignments and other studies was extremely difficult. Although the period given for the project, the deadlines frequently collided.

5.3 Recommendations

Although this study does not address such an interesting or even obvious topic at times, some recommendations are necessary. As mentioned above, the technology area is very broad, as are the functions present within the accounting area. Therefore, for future research purposes I recommend that it be focused only on one technology or one area of accounting. This breadth makes data collection difficult and the survey may seem vague.

References

- ACCA. (n.d.). *The power of future-ready talent - upskilling*. ACCA. Retrieved March 15, 2022, from <https://yourfuture.accaglobal.com/global/en/blog/upskilling.html>
- Alharahsheh, H. H., & Pius, A. (2020, June 30). A Review of key paradigms: positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, 2(3), 39-43.
10.36348/gajhss.2020.v02i03.001
- Bazeley, P. (2004). *1 Issues in Mixing Qualitative and Quantitative Approaches to Research*. Applying qualitative methods to marketing management research.
https://www.researchgate.net/profile/Pat-Bazeley-2/publication/228469056_Issues_in_Mixing_Qualitative_and_Quantitative_Approaches_to_Research/links/5570606308ae7d0f5f900d4a/Issues-in-Mixing-Qualitative-and-Quantitative-Approaches-to-Research.pdf?origin=pub
- Berriman, J. (n.d.). *Cyber security challenge*. ACCA Global. Retrieved October 4, 2022, from <https://www.accaglobal.com/vn/en/student/sa/features/cyber.html>
- Chiheb, F., Boumahdi, F., & Bouarfa, H. (2019, May 02). *A New Model for Integrating Big Data into Phases of Decision-Making Process*. ELSEVIER. Retrieved March 31, 2022, from [https://pdf.sciencedirectassets.com/280203/1-s2.0-S1877050919X00071/1-s2.0-S1877050919305472/main.pdf?X-Amz-Security-Token=IQoJb3JpZ2luX2VjENr%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIQCsWqa0P1dU%2Fnk3MNvOZ7y242Vn%2FkpVF7RDwYSFGOPphwlGDIzGyaxAS](https://pdf.sciencedirectassets.com/280203/1-s2.0-S1877050919X00071/1-s2.0-S1877050919305472/main.pdf?X-Amz-Security-Token=IQoJb3JpZ2luX2VjENr%2F%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIQCsWqa0P1dU%2Fnk3MNvOZ7y242Vn%2FkpVF7RDwYSFGOPphwlGDIzGyaxAS)
- Driscoll, D. L., Appiah-Yeboah, A., Salib, P., & Rupert, D. J. (2007). Merging Qualitative and Quantitative Data in Mixed Methods Research: How To and Why Not. *Ecological and Environmental Anthropology*, 3(1), 19-28.
<https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1012&context=icwdmee>
- Gustafsson, J., & Jerking, P. (2021, May). *Automation in accounting* [Master Thesis in Business Administration]. Diva-Portal. Retrieved March 23, 2022, from <https://www.diva-portal.org/smash/get/diva2:1561855/FULLTEXT01.pdf>

- ICAEW. (2021, June 03). The Future of Accounting - Will Accountants Become Obsolete? - ICAEW Asia. Retrieved March 26, 2022, from <https://icaew.ca-sea.asia/vi/the-future-of-accounting-will-accountants-become-obsolete-2/>
- ICAEW. (2022, March 7). *The new technology reshaping the finance function*. ICAEW.com. Retrieved October 7, 2022, from <https://www.icaew.com/insights/viewpoints-on-the-news/2022/Mar-2022/CFO-The-new-technology-reshaping-the-finance-function>
- Kaplan. (2020, February 27). *7 soft skills needed for accounting in 2020 and beyond*. Kaplan. Retrieved May 2, 2022, from <https://kaplan.co.uk/insights/article-detail/insights/2020/02/27/7-soft-skills-needed-for-accounting-in-2020-and-beyond>
- Kaya, C. T., Turkyilmaz, M., & Birol, B. (2019, April). Impact of RPA Technologies on Accounting Systems. *The Journal of Accounting and Finance*, 235-250. 10.25095/mufad.536083
- McChesney, K., & Aldridge, J. M. (2019, March 29). Weaving an interpretivist stance throughout mixed methods research. *International Journal of Research and Method in Education*, 42(3), 225-238. <https://www.tandfonline.com/doi/full/10.1080/1743727X.2019.1590811>
- Mordor Intelligence. (2022). *AI In Accounting Market Size, Share, Growth (2022 - 27)*. Mordor Intelligence. Retrieved October 4, 2022, from <https://www.mordorintelligence.com/industry-reports/artificial-intelligence-in-accounting-market>
- Morehouse, L. (n.d.). *How AI, Cloud, And Robots Will Revolutionize SMB Accounting*. Forbes. Retrieved May 2, 2022, from <https://www.forbes.com/sites/forbesfinancecouncil/2017/03/13/how-ai-cloud-and-robots-will-revolutionize-smb-accounting/?sh=21af929b10b7>
- Nagarajah, E. (2016). Hi, Robot What does automation mean for the accounting profession? *PWC - Accountants Today*. <https://www.pwc.com/my/en/assets/press/1608-accountants-today-automation-impact-on-accounting-profession.pdf>
- Najem, R., Amr, M. F., Bahnasse, A., & Talea, M. (2022, August 9). *Artificial Intelligence for*

Digital Finance, Axes and Techniques. ELSEVIER. Retrieved September 25, 2022, from <https://reader.elsevier.com/reader/sd/pii/S1877050922006974?token=4F3BFDD4ED605CCECFB0EE3F15E73119FD94E096AEE82CCF86A0BE048767B2F4B18D27FAC352C3551A8A68CD204BF&originRegion=eu-west-1&originCreation=20221103174730>

Onwuegbuzie, A. J., & Combs, J. P. (2011, April 20). Data Analysis in Mixed Research: A Primer. *International Journal of Education*, 3(1), 1-25. 10.5296/ije.v3i1.618

Osmani, M., Hindi, N., & Weerakkody, V. (2020, October 4). Incorporating Information Communication Technology Skills in Accounting Education. *International Journal of Information and Communication Technology Education*, 16(4), 100-110. DOI: 10.4018/IJICTE.2020100107

Pepe, A. A. (2011, April 19). *The Evolution of Technology for the Accounting Profession*. CPA Practice Advisor. Retrieved March 15, 2022, from <https://www.cpapracticeadvisor.com/2011/04/19/the-evolution-of-technology-for-the-accounting-profession/1159/>

Radhakrishnan, R. (2014, March 22). Sampling in Mixed Methods Research. *International Journal of Advances in Nursing Management*, 2(2014), 24-27. https://www.researchgate.net/publication/338517161_Sampling_in_Mixed_Methods_Research_International_Journal_of_Advances_in_Nursing_Management_Jan_-_Mar_2014

Saunders, M. N.K., Lewis, P., & Thornhill, A. (2019). Research Methods for Business Students. *Research Methods for Business, Eight Edition*(30/01/2019), 128-164. Retrieved October 20, 2022, from https://www.researchgate.net/profile/Mark-Saunders-10/publication/330760964_Research_Methods_for_Business_Students_Chapter_4_Understanding_research_philosophy_and_approaches_to_theory_development/links/5c53056f299bf12be3f0e2cf/Research-Methods-for-Business

Skolding, L. (2018, February 26). *How the fourth industrial revolution is impacting accountancy*. Accountancy Age. Retrieved March 15, 2022, from <https://www.accountancyage.com/2018/02/26/fourth-industrial-revolution-impacting-accountancy/>

Tang, M., & Neave, M. (2020, March 12). *Will AI Accounting Replace Human Accountants in The Future?* Boss of Cloud. Retrieved March 26, 2022, from <https://bossofcloud.com/ai-accounting/>

Teddlie, C., & Yu, F. (2007, January). Mixed Methods Sampling: A Typology With Examples. *Journal of Mixed Methods Research*, 1(2007), 77 - 100. 10.1177/2345678906292430

Wann, B. (2022, September 20). *12 Major Challenges Faced By The Accounting Profession (With Solutions)*. Benjamin Wann.com. Retrieved November 26, 2022, from <https://benjaminwann.com/blog/12-major-challenges-faced-by-the-accounting-profession-with-solutions>