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Opportunities, challenges and development areas of chartered accountants in the Fourth Industrial Revolution

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Orientation: The Fourth Industrial Revolution (4IR) marks a period of tremendous technological progress, altering professions across industries, including chartered accountancy.

Research purpose: The purpose of the study was to explore the opportunities and challenges, for chartered accountants (CA) in the 4IR, emphasising the changing roles, competencies and problems they confront in this transitional era.

Motivation for the study: Scholars have recently issued numerous calls towards the understanding of subjective perceptions and *in situ* responses to 4IR in professionals and organisational realities.

Research approach/design and method: The research followed a qualitative approach to data collection and obtained the data through 14 semi-structured interviews. This research provides an in-depth insight into the 4IR's implications for CAs and their profession.

Main findings: The findings reveal that the 4IR offers opportunities for enhanced work–life balance, risk reduction and increased productivity. Challenges raised by CAs included privacy issues, the need for updated training and competencies and the stress of job redundancy.

Practical/managerial implications: Recommendations are made to meet the 4IR's opportunities and challenges. Chartered accountancies are expected to embrace continuous learning, work closely with professional organisations, match technological goals with client demands, cultivate a culture of curiosity and keep informed through collective awareness. Training needs to address these aspects.

Contributions/value-add: Policymakers and regulatory organisations should encourage professional bodies to become aware of opportunities and challenges of the 4IR and use this for future development.

Keywords: qualitative research; chartered accountants (CAs); the Fourth Industrial Revolution (4IR); challenges; opportunities.

Introduction

In the Fourth Industrial Revolution (4IR), technology has fused and is reshaping society, transforming how organisations conduct operations (Bughin et al., 2018; SAICA, 2023; Schwab & World Economic Forum, 2016). According to Kroon et al. (2021), as well as Marx et al. (2020), 4IR technologies may affect chartered accountants' (CAs) tasks and skills in the accounting profession. Owing to the decrease in manual processes, CAs will be able to focus on higher-value tasks, such as analysing and interpreting data (AICPA & CanadaCPA, 2020). However, CAs' adoption of new technologies may be challenged by a variety of barriers, such as security concerns, cost-saving concerns and technology competence and compatibility (Davies, 2022; Jackson et al., 2022).

The 4IR is defined as the emergence of 'cyberphysical systems' that involve fundamental changes in human and machine capabilities (Davis, 2016). Technology and infrastructure from the Third Industrial Revolution (3IR) are key to these changes and impacts during the 4IR on numerous socioeconomic sectors (Chou, 2018) and affect employees (Rotatori et al., 2021), including the ones in the CA profession (Tsiligiris & Bowyer, 2021). It has been noted that technological advances have resulted in the automation and simplification of many tasks formerly carried out by CAs (Mariaye & Samuel, 2018). This has changed the skills and competencies necessary to succeed in the industry (Harrast, 2020) and has opened up opportunities and challenges in the CA profession that needs to be addressed.

Smart technologies, quantum computing and autonomous vehicles are all advancing in the 4IR's landscape, and there is a shift affecting long-held assumptions about the nature of work and the role of humans in an increasingly changing workplace (Manyika et al., 2017; Schwab & World Economic Forum, 2016). As a result of the ongoing societal changes, work activities, skill demands and the composition of the labour pool are expected to be significantly impacted (Rotatori et al., 2021), even though an investigation into the future of work and its workforce requirements is still in its infancy.

The CA profession has been changing significantly in recent years, driven by technological advancement and increased demand for digitalisation (IFAC, 2017). These changes have been caused by various factors: the rapid development of technology, globalisation, facilitating accessible communication via the Internet and changes in legislation and regulations (Kroon et al., 2021). Therefore, with an increased demand for the use of technology in the CA profession, CAs need to adapt to stay relevant and competitive (Du Chenne, 2023; Kroon et al., 2021). Thereby, CAs play a critical role in adopting new technologies and changing business practices (Dancey, 2016) and continuously transforming the accounting profession (Hoffman, 2017). Research on the 4IR has, so far, focused on the unique skills and competencies required of CAs to function in the 4IR (Barac et al., 2021; Du Chenne, 2023). However, limited research has been conducted on CAs' perception of the 4IR challenges and opportunities, and this will therefore be addressed in this article.

Purpose and contribution

The purpose of the study is to explore the opportunities, challenges and development areas for CAs in the 4IR, emphasising the changing roles, competencies and problems they confront in this transitional era. The study contributes original findings from the South African CAs' context and presents their perceptions on opportunities, challenges and developmental areas in the context of the 4IR.

Opportunities and challenges of the Fourth Industrial Revolution in the chartered accountancy profession

In the 4IR, opportunities and challenges may affect how individuals perceive and adopt new technologies (Xu et al., 2018) and how they define developmental areas of the profession. Research has pointed out that opportunities of the 4IR are anchored in organisations improving their efficiency and productivity over time (Schwab & The World Economic Forum, 2016): communications and transportation costs will drop, supply chains and logistics will become more efficient and trade costs will decrease, which will have a positive effect on markets and economies. Thereby, the 4IR could improve the quality of life for millions of people worldwide (Jee, 2017). However, the 4IR will affect CAs both positively and negatively and bring both opportunities and challenges that the profession must cope with (Tsiligiris & Bowyer, 2021). Thereby, indirect and direct opportunities may exist (Mbizi et al., 2022). Digital technologies provide opportunities for accessing previously unattainable data. The result might be of better quality and is more accurate data that take less time. In addition to improving decision-making information, it can also enhance process assurance (Du Chenne, 2023; Hart, 2017). Technology integration in CA can reduce data manipulation time and human error, as well as energy and stationary requirements (Stoica & Ionescu-Feleagă, 2022).

However, the 4IR may also pose some social, medical, ethical and psychological challenges (Schwab, 2017; Xu et al., 2018). These challenges include an increase in inequality (Chalmers et al., 2021; Li et al., 2017; Prisecaru, 2016; Schwab, 2017; Xu et al., 2018), security (Alaloul et al., 2020; Prisecaru, 2016; Ross & Maynard, 2021; Schwab, 2017; Skilton & Hovsepian, 2018) and identity, voice and community (Hirschi, 2018; Philbeck & Davis, 2018; Schwab, 2017; Skilton & Hovsepian, 2018).

Individuals' overreliance on digital markets and the possibility that the 4IR will increase unemployment rates can be attributed to an increase in inequality (Chalmers et al., 2021; Schwab, 2017). It is predicted that automation will replace labour, thereby increasing the gap between returns to capital and labour (Xu et al., 2018). As a result of technological advancements, the 4IR creates and destroys jobs (Schwab, 2017). In contrast, the types of jobs the 4IR creates require more education and specialised training, while those being destroyed are physical and routine in nature (Schwab, 2017; Sutherland, 2020). Consequently, it disproportionately affects older people and lower-income individuals (Schwab, 2017).

Additionally, various security concerns, such as the convergence of technology and the digital world, create new strategic spaces for conflict, enhancing access to lethal weapons and making it more challenging for states to govern and negotiate (Schwab, 2017). Therefore, cyberspace poses the same security threat to human-to-human engagement as land, sea and air (Schwab, 2017). It is harder to govern and establish and enforce international agreements and norms for peaceful conflict resolution in cyberspace, as it is not only accessible to the state, but to non-state actors as well. Consequently, the 4IR will face the challenge of coordinating large numbers of potentially lethal actors in both the public and private sectors across multiple strategic and cultural contexts (Schwab, 2017).

Social media expands across different countries, and there is a decrease in the diversity of worldviews, thus diminishing new sources for identity, voice and community (Schwab, 2017). A clear work identity is also becoming increasingly difficult (Hirschi, 2018), resulting in increased inequality and conflict (Schwab, 2017). The 4IR affects and influences privacy, ownership and interpersonal relationships by increasing the disconnect between physical and digital identities (Viljoen & Viljoen, 2021). This change primarily

involves digital media, as it reframes societies, connects individuals in new ways and creates unrealistic expectations for individuals with the spread of radical ideologies (Viljoen & Viljoen, 2021).

The success of CAs will be determined by their ability to respond to 4IR opportunities and challenges and to embrace aspects of value creation and sustainability beyond their conventional capabilities (SAICA, 2021). Numerous challenges for CAs were identified by SAICA (2021) as part of its focus on Artificial Intelligence (AI) (such as machine learning and robotics), blockchain technologies (which are changing businesses, economic systems and social systems) and integrated thinking and reporting (as information volumes increase, business operations become increasingly complex). Implementing new technologies related to the 4IR poses challenges (Grosu et al., 2023), such as implementation costs, change management compliance with regulatory frameworks, insufficient competencies, unauthorised access to data and power outages (Budnik et al., 2017).

Additionally, CAs must keep up with new accounting standards and navigate the constantly shifting regulatory environment. They should therefore constantly be updated regarding technological training and competency requirements (Zhyvets, 2018), communication and interpersonal skills, as well as intercultural competences, technological advancements and industry trends (Jui & Wong, 2013).

Chartered accountancies will be required to adapt to these technologies to assist in facilitating change in other organisations (Kroon et al., 2021). Investing in new technologies can be expensive, so companies need to weigh the potential costs against the potential profitability (Hart, 2017). Furthermore, they need to know how CAs perceive the 4IR changes where they see opportunities, challenges and developmental areas. This study aims at exploring the perceptions of CAs during the crucial time of the 4IR and explore the perceived opportunities, challenges and developmental areas.

Research design

This study used a qualitative research methodology to explore the opportunities, challenges and development areas for CAs in the 4IR work environment (Tenny et al., 2023). Qualitative research focuses on creating meaning and deep knowledge (Denzin & Lincoln, 2012) to understand participants' experiences, perceptions and behaviours (Tenny et al., 2023; Yin, 2009).

Research method

The researchers adopted a constructivist ontological approach as they aimed to understand the subjective perspectives and the interpretation of CAs regarding the 4IR's opportunities, challenges and developmental areas (Howes & O'Shea, 2014).

Research setting

The study population was CAs across different companies internationally, registered as CAs or CA clerks at the necessary boards within their countries of work.

Entrée and establishing researcher roles

One of the researchers established contact with potential research participants through LinkedIn messages or email messages explaining the purpose of the study and inviting them to participate. Participants who voluntarily consented to participate made up the sample size.

Sampling

A sample size of 14 participants was selected using non-probability (Berndt, 2020; Etikan & Bala, 2017), purposive (Campbell et al., 2020; Etikan et al., 2016) and convenience sampling (Bekwa et al., 2019; Etikan et al., 2016; Obilor, 2023) techniques. Inclusion criteria for the sample were: (1) a minimum age of 18 years, (2) English, Afrikaans or Dutch-speaking participants and (3) employed in an organisation as a CA or CA clerk. The researchers used data saturation (Braun & Clarke, 2021) as a guiding principle and stopped interviewing when reoccurring patterns and themes occurred. An overview of the sociodemographic backgrounds of participants is given in Table 1.

Data collection

Data were collected through online semi-structured interviews using Microsoft (MS) Teams (Campbell et al., 2021). Participants were asked open-ended questions. Researchers did not set a time limit for the interviews, which took between 30 min and 60 min. Microsoft Teams recording and transcription application were used to record the interviews to ensure the data were accurate and transcribed correctly (Alshenqeeti, 2014). A thorough review of the transcriptions was conducted after the interviews (Braun & Clarke, 2021). Corrections were made to the transcription where errors were noticed and redundant, unnecessary words were removed. A password-protected file on one researcher's computer contained the transcriptions, which could only be accessed by the researchers (Surmiak, 2018).

Data analysis

Recognising themes within qualitative data is commonly known as thematic analysis, which should not be used as a method but as a tool across different methodologies (Boyatzis, 1998; Braun & Clarke, 2006).

Analysis and interpretation of the findings from the identified themes was accomplished using ATLAS.ti in conjunction with Braun and Clarke's (2006) six-step model: familiarising oneself with the data, generating initial codes, searching for overlapping patterns or themes, reviewing the patterns and themes identified in step three, defining the

TABLE 1: Sociodemographic background of participants.

Participant	Age (years)	Gender	First language/s	Nationality	Country of residence	Rank in organisations	Tenure in position
1	36	Male	Cantonese	Australian	Germany	Senior executive manager	1 year
2	25	Male	English	Malawian	United Kingdom	Assistant manager	1 year
3	30	Male	English	South African	United Kingdom	Manager	3 years
4	26	Female	English	South African	The Netherlands	Audit manager	2 years
5	26	Male	English	Dutch and South African	The Netherlands	Senior assistant accountant	8 months
6	26	Male	English	South African	The Netherlands	Financial manager	8 months
7	28	Male	Tswana	Botswana	Australia	Assistant manager	1 year, 6 months
8	29	Female	Zulu	South African	United Kingdom	Senior consultant	1 year, 3 months
9	32	Male	English	Indian	The Netherlands and India	Manager	3 years, 6 years
10	44	Male	Afrikaans	South African	Australia	Associate director	2 years
11	27	Female	English	South African	South Africa	Associate director	4 months
12	24	Male	English and Afrikaans	South African	The Netherlands	Article clerk	2 years
13	31	Male	Afrikaans	South African	South Africa	Associate director	1 year
14	29	Female	English	South African	South Africa	Audit manager	1.5 months

overlapping themes identified and reviewed and writing down the findings from the analysis. The codes were generated by exploring the transcripts. To construct context and themes, the researchers selected the most frequently occurring codes, using an inductive approach to understand the opportunities, challenges and development areas for CAs in the 4IR. The transcripts were supplemented with notes taken during interviews, which summarised all information under parallel themes. The researchers discussed the findings and interpreted them (Nowell et al., 2017). Using reflexivity, the researchers ensured consciousness of how their beliefs and thoughts could influence the study (Dodgson, 2019).

Strategies employed to ensure data quality and integrity

A rigorous and systematic research process was followed, and multiple data sources were used to ensure rigour in the research (Johnson et al., 2020). To ensure the research's quality, the researcher must consider the quality criteria of qualitative data: rigour, trustworthiness, dependability, credibility, confirmability and transferability (Korstjens & Moser, 2018; Lincoln & Guba, 1985). A clear audit trail of the research process (LinkedIn conversations, recordings, transcriptions and emails; Nowell et al., 2017; Thomas, 2017) was maintained by the researchers to ensure trustworthiness. In establishing trustworthiness, Lincoln and Guba (1985) created criteria for the researcher: credibility, dependability, confirmability and transferability. Trustworthiness refers to the authenticity of the data and findings reflecting the lived experiences of the phenomena investigated (Curtin & Fossey, 2007). Debriefing the participants and explaining the subsequent phases of the research process increased their trustworthiness. During the research process, participants were encouraged to ask questions about any uncertainties they had (Nowell et al., 2017; Thomas, 2017). In addition to facilitating transferability, the researcher also provides extensive descriptions (Lincoln & Guba, 1985). During the research, definitions of concepts that participants may be uncertain about were provided where applicable to enhance transferability.

Ethical consideration

Ethics approval was granted by the University of Johannesburg's Division of Industrial Psychology and People Management with clearance reference number: IPPM 2021 574. To ensure that participants could make an informed decision about their participation, the nature of the study was explained to them before consent was requested (Neuman, 2011). Researchers provided the opportunity to ask questions (Neuman, 2011). A password-protected file was used to store the interview voice recordings (Cychosz et al., 2020). The privacy and confidentiality of all participants were assured (Terre Blanche et al., 2016).

Results

In the following, findings will be presented with regard to the opportunities and challenges of the CAs regarding the 4IR.

Opportunities for chartered accountancies in the Fourth Industrial Revolution

In the transformative era of the 4IR, various aspects are reshaping the landscape for CAs, leading to a profound impact on their roles and responsibilities. Efficiency was one of the central principles recognised as a positive advantage, leading to enhanced work processes and precision (all participants). P10 noted:

> 'You can automate a lot of things, and you don't have to spend so much time on doing it, but you can rather spend more time on the actual interpreting.' (P10, 44 years old, male, Afrikaans-speaking)

P10 is a 44-year-old, male, Afrikaans-speaking South African who has been an associate director for over 2 years and resides in Australia. He points out that automation and AI-driven technologies are seen as tools that will significantly enhance efficiency by saving time and allowing CAs to allocate their skills and expertise to more value-added activities. P2 echoed this viewpoint:

> 'The process leading up to giving that judgment will become more streamlined and efficient.' (P2, 25 years old, male, English-speaking)

P2 is a 25-year-old, male, English-speaking Malawian who has been an assistant manager for 1 year and resides in the United Kingdom. He reiterated that the 4IR and its technologies will assist in streamlining processes and saving CAs' time regarding not having to do mundane and repetitive tasks. The enhanced efficiency stems from the automation of repetitive tasks, allowing reduced variability and providing more consistent results, leading to risk reduction. The risk is reduced because of repetitive and time-consuming automated tasks, leaving no room for human error (P1, P4, P8, P9, P12, P13, P14). P12 noted:

> 'I think as much as I don't know how crypto links exactly to it, but blockchain, I think there's a lot that we can still gain from that because if you can put everything on that, your risk of fraud becomes so much less.' (P12, 24 years old, male, English- and Afrikaans-speaking)

P12 is a 24-year-old, male, English- and Afrikaans-speaking South African who has been an article clerk for 2 years and resides in the Netherlands. The participant points out the potential of reducing certain risks associated with financial statements, indicating that it would not only safeguard financial integrity but also enhance the overall reliability of the accounting and auditing practice. Moreover, automation of tasks will not only free up time for CAs to invest it better in their work but will also allow CAs to have a better work–life balance (P3, P4, P5, P6, P7, P11, P12, P13). This was made clear by P5:

> '… more things are automated it will lead to less overtime, less or possibly more free time outside of work …' (P5, 26 years old, male, English- and Dutch-speaking)

P5 is a 26-year-old, male, English- and Dutch-speaking South African who has been a senior assistant accountant for 8 months and resides in the Netherlands. P4 echoed the following:

> '… you're trying to reduce the hours that people work in a week … So I think that is where it's driven for them.' (P4, 26 years old, female, Afrikaans-speaking)

P4 is a 26-year-old, female, Afrikaans-speaking South African who has been an audit manager for 2 years and resides in the Netherlands. She is open and optimistic about the 4IR and the automation of specific tasks through technology, which might create fewer working hours for the CA and, thus, more personal time. This advancement is accompanied by cost benefits for organisations (P1, P4, P8, P9, P10, P11, P13, P14). P2 highlighted the following:

> '… processing large quantities of data with more accuracy would lead to time savings on the part of the Chartered accountant.' (P2, 25 years old, male, English-speaking)

Therefore, the organisation and the CA would benefit from one another. The 4IR would increase organisational efficiencies, reducing costs and time and benefiting the CA by providing them with more personal time and less overtime. Although concerns about redundancy persist, CAs see the 4IR driving the creation of new professional roles contingent upon their ability to acquire new skills (P1, P4, P6, P13). P1 emphasised the following:

> '… new roles as someone who analyses trends and tries to figure out where to extract value out of the results of data that's been analysed by automated tools …' (P1, 36 years old, male, English- and Cantonese-speaking)

P1 is a 36-year-old, male, Cantonese-Australian who has been a senior executive manager for 4 months and resides in Germany. Although there might be the fear of redundancy, the participants perceive that new roles will be created through the transition of the CA profession in the 4IR. Thus, if they adopt and learn new skills concerning technology, it will bring new opportunities for the CA profession outside of their traditional roles. Ultimately, the intertwined principles of efficiency, work–life balance, cost–benefit, role creation and risk reduction herald a dynamic era of transformation for CAs in the realm of 4IR technologies and systems.

Challenges for chartered accountancies in the Fourth Industrial Revolution

Chartered accountancies navigate numerous challenges, including a shortage of skills and knowledge, privacy concerns, work ethics and work security. These intertwined principles are vital in the CA professions' response to the transformative impact of technology and automation. These challenges influence their roles and shape their perspectives. Skills and knowledge shortages overlap significantly with the fear of redundancy (work security). The lack of essential skills and knowledge among CAs poses a disadvantage to the profession in the current landscape of the 4IR, as this could also lead to misinterpretation and mistakes arising because of insufficient understanding of technology (P1, P2, P4, P7, P11, P12). This was highlighted by P2 as follows:

> 'The new technologies would be complex. So there might be a large learning curve at the beginning of the adoption of these technologies … Maybe there might be issues with respect to staying abreast with what's new and how that would impact the individual?' (P2, 25 years old, male, English-speaking)

Because of the rapidly changing nature of the 4IR and the technologies that accompany it, it might be difficult for CAs to continuously stay updated on what is new and vital. Additionally, there is a challenge of learning to use and implement new systems and technologies. It might be challenging for CAs to be updated and informed constantly. P1, however, highlighted that because of the newly automated tasks, up-and-coming CAs will not have the same exposure to the skills and knowledge CAs had before them. This could lead to challenges in the future, as they will not understand the basic foundational work that is now being done by technology:

> 'A lot of the detail work is either automated or offshore … I feel like they've jumped a number of steps …' (P1, 36 years old, male, English- and Cantonese-speaking)

The participant highlights that there might be an issue with specific tasks that cannot be offshored, or if a system crashes, there will be roles that new and up-and-coming CAs would

not know how to do. Furthermore, the shift towards automation and technology-driven processes opens the door to privacy concerns (P2, P4, P7, P12). This was highlighted by P6, who mentioned concerns about 'external hacking, bugs in the system' (P6, 26 years old, male, English-speaking).

P6 is a 26-year-old, male, English-speaking South African who has been a financial manager or controller for 8 months and resides in the Netherlands. Therefore, keeping clients' information safe and confidential could challenge the CA profession with the shift to online processes. Work security and potential for redundancy are additional looming concerns for CAs, as their roles in organisations are going to be reduced because of the automation of specific tasks (P1, P2, P3, P4, P6, P7, P8, P9, P10, P11, P13, P14). P1 mentions that automation 'deprives the junior auditors … $5 million audit won't be necessary …' (P1, 36 years old, male, English- and Cantonese-speaking). The automation of tasks will slim down profit margins on audits and the teams necessary for each of these audits. Thus, the 4IR can potentially threaten the job security of CAs.

Development areas for chartered accountancy in the Fourth Industrial Revolution

The evolving landscape of the CA profession during the 4IR has led to a demand for several core competencies and skills among CAs, as highlighted by the participants in this study. Critical thinking and analytical skills are essential, as participants highlighted the need for CAs to transition from data processors to data analytics and strategic thinking (P4, P6, P8, P9, P10, P13, P14). This shift was brought to the surface by P2 who highlights 'analysing data and translating it into finance to develop solutions' (P2, 25 years old, male, English-speaking).

This perspective highlighted the importance of analytical processing and critical thinking for CAs to assist in business solutions. This was further supported by P13:

> 'More opening up critical thinking ... if you look at your BIG4 firms, they actually had a big push in terms of data analytics, etc.' (P13, 31 years old, male, Afrikaans-speaking)

P13 is a 31-year-old, male, Afrikaans-speaking South African who has been an associate director for 1 year and resides in South Africa. He indicates a clear need for the CAs to shift their minds to a more analytical and critical thinking as businesses enforce this narrative. As technology increasingly intertwined with the CA role, participants recognised the essential role of IT skills and knowledge to be competent CAs (P5, P6, P9). This was evident from P9's perspective:

> 'Until you get your hands into the dirt and grime of things, I personally wouldn't feel comfortable about having done a good enough job on the audit just based on if all the sort of grass looks pretty and data ties up cleanly.' (P9, 32 years old, male, English-speaking)

P9 is a 32-year-old, male, English-speaking Indian who has been a manager for three and a half years and resides in the Netherlands and India. For CAs to remain knowledgeable and provide assurances, they need to understand the processes they are using to be confident and comfortable in providing those assurances. This perceived level and degree of knowledge needed may differ from perspectives, but the agreement of needing to understand what you are working with and on seems to be necessary. This may be because of the participants, who have mentioned the need for knowledge, whose backgrounds are from third-world countries where corruption is a big issue.

The participants of this study all indicate a need for new knowledge, expertise and continuous learning in the CA profession. P3 highlights that it would be beneficial if CAs were exposed to continuous learning:

> '… AI understanding tools, such as ChatGPT and daly2 and mid-journey. If they can implement that into the curriculum or the competency basis, I think, that would improve Chartered Accountants.' (P3, 30 years old, male, English-speaking)

P3 is a 30-year-old, male, English-speaking South African who has been a manager for 3 years and resides in the United Kingdom. Even though CAs must comply with continuous learning, the shift from undergraduate studies to work seems quite extensive. Therefore, considering the 4IR training while at university would be beneficial to mitigate this and ensure that the CAs are professionally well equipped. Incorporating the 4IR and its technologies has shifted how CAs interact with colleagues and clients (P2, P11, P14). For example, P11 stated:

> 'It's changing socially how we behave ... they more want to stay behind their keyboard ... it's really changed how we interact with humans.' (P11, 27 years old, female, English-speaking)

P11 is a 27-year-old, female, English-speaking South African who has been an associate director for 4 months and resides in South Africa. Incorporating technology in the CA profession is making less human interaction necessary, as most communication is online and, therefore, limits in-person contact. This leads to individuals losing the ability to interact with their peers and clients effectively. P11 and P14 felt very strongly about the lack of these skills, and therefore, it is essential to note that both participants are females who live in and come from South Africa.

The predictions for the development of the accounting profession in the next 15–20 years were mixed. Some believe that technology, such as AI and automation, will significantly change the profession, automating repetitive tasks and reducing the need for manual data entry (P2, P3, P4, P5, P6, P8, P11, P13). As stated by P5:

> 'Less a lot less manual invoices entering of data as I think a lot of that, or almost all of it would be automatically done.' (P5, 26 years old, male, English- and Dutch-speaking)

P5 is a 26-year-old, male, English and Dutch-speaking South African who has been a senior assistant accountant for 8 months and resides in the Netherlands. Therefore, incorporating automation and technology in the profession

will lead to fewer manual and repetitive tasks for the CA. This then could lead to a change in the role of the CA as some functions might become redundant (P2, P3, P4, P5, P7, P8, P9, P10, P13, P14). Therefore, the CAs need to upskill to enter a new area of the profession that the 4IR and automation will create. This is evident in P13's perspective:

> 'I don't think it'll necessarily be the normal auditor or the normal trainee that you see today. It will be someone that's been forced to go towards the thinking side of it and being more open to technology using more technology.' (P13, 31 years old, male, Afrikaans-speaking)

P13 is a 31-year-old, male, Afrikaans-speaking South African who has been an associate director for 1 year. He resides in South Africa and he believes that the CA's role will change drastically in the future and that the CAs need to become proactive and will have to adapt to stay relevant. There are, however, contradicting views as some participants (P1, P3, P14) perceive the profession to stay the same and have minimal changes, as stated by P1:

> 'The pessimist in me says very little because I highly doubt the leaders in the profession today will adopt this wholeheartedly.' (P1, 36 years old, male, English- and Cantonese-speaking)

The CA may resist the change as it could lead to negative aspects such as job redundancy and profit loss. There is also optimism that technology can be harnessed to improve auditing (P3, P6, P8, P12), fighting money laundering and fraud, as stated by P6:

> 'So I just see more that we will get to a point where we have implemented them and we apply it and it has improved the quality and effectiveness of every job.' (P6, 26 years old, male, English-speaking)

P6 is a 26-year-old, male, English-speaking South African who has been a financial manager or controller for 8 months and resides in the Netherlands. According to him, the implementation of technology will lead to the enhancement of the CA profession.

Overall, it can be summarised that CAs expect the profession to become more data and technologically driven (P2, P8, P10, P12, P13, P14) and that they have to adjust to the development by developing further.

Discussion

The CA's perceptions within this study of the 4IR were multifaceted, reflecting a wide range of attitudes and beliefs in the profession. Therefore, exploring these beliefs and attitudes indicates how the participants perceive the 4IR, and according to Gibbs (2005) and Ittelson and Kilpatrick (1951), this influences the CAs' behaviour towards the 4IR and the technological advancement accompanying the 4IR.

The CAs perceived the 4IR to hold specific advantages and disadvantages.

The possible advantages included efficiencies leading to enhanced work processes and precision (all participants), allowing CAs to allocate their skills and expertise to more value-added activities. The perception that 4IR technologies bring about efficiencies leading to enhanced work processes was consistent with the literature. One of the main advantages of the 4IR has been the automation and streamlining of tasks using technology (Awang et al., 2022; Balios, 2021; Grosu et al., 2023; Stoica & Ionescu-Feleagă 2022). This agreement with earlier studies emphasises how well-understood it is that technology can enhance work processes in the accounting industry.

The perceived risk is reduced because of repetitive and time-consuming automated tasks, leaving less room for human error (P1, P4, P8, P9, P12, P13, P14). The potential of reducing certain risks associated with financial statements is highlighted, indicating that it would safeguard financial integrity and enhance the overall reliability of the accounting and auditing practice. The idea that automating repetitive, time-consuming processes reduces risk is consistent with the literature's emphasis on how technology may improve risk management in accounting (Awang et al., 2022; Balios, 2021; Grosu et al., 2023). Automation reduces human error, which is a well-known benefit in the industry.

Additionally, automation of tasks will not only free up time for CAs to invest their time better in their work but can also potentially allow CAs to have a better work–life balance (P3, P4, P5, P6, P7, P11, P12, P13). The perception that the 4IR can lead to a better work–life balance is a prominent driving force behind why CAs were open and optimistic about the 4IR and the automation of specific tasks through technology. Therefore, the hope was that the efficiency would flow into creating fewer working hours for the CAs and contribute to more personal time. This potential benefit was not mentioned in the reviewed literature and, therefore, is an additional factor to consider in motivation for accepting and being open towards the 4IR. This advancement can be accompanied by organisational cost benefits (P1, P4, P8, P9, P10, P11, P13, P14). Therefore, both the organisations and the CAs would have potential benefits from automation. The understanding that automation reduces business costs was consistent with recent studies on the financial benefits of 4IR technologies (IFAC, 2017). Adopting new technology can reduce costs, which has financial repercussions for CAs and the organisations they support.

The CAs in this study seem to believe that the 4IR can be highly beneficial. However, they also acknowledged some drawbacks and difficulties with this technological change. These findings are consistent with previous research examining the potential adverse effects of the 4IR in the context of the accounting industry. The lack of essential skills and knowledge among CAs poses a disadvantage to the profession in the current landscape of the 4IR skills (P1, P2, P4, P7, P11, P12), as this could also lead to misinterpretation and mistakes arising because of insufficient understanding of new technologies. This finding was consistent with prior research highlighting the value of support from academia, professional organisations and training initiatives to close

the skills gap (Grosu et al., 2023). In line with earlier studies, it also emphasises the need to change the competency base (Grosu et al., 2023).

Concerns about the unfamiliarity with 4IR technologies were raised by numerous participants (P1, P2, P4, P5, P7, P8, P9, P10, P11, P12, P13, P14). This is consistent with the literature that has previously stressed the need for professionals to learn new skills and adjust to fast-changing technologies (Davis, 2016; Schwab & World Economic Forum, 2016). The learning curve connected with these technologies can be challenging for CAs who must keep up with recent developments. Additionally, there is a challenge of learning to use and implement these systems and technologies, and therefore, it might be challenging for CAs to stay updated and informed.

Privacy issues and difficulties arise because of the move towards automation and technology-driven procedures (P2, P4, P7, P12). The transition to online operations may present a challenge for the CA profession in protecting the privacy and security of clients' information. This worry is congruent with the literature about data security and privacy in the digital era (Alaloul et al., 2020; Davies, 2022; Jackson et al., 2022; Prisecaru, 2016; Ross & Maynard, 2021; Schwab, 2017; Skilton & Hovsepian, 2018). As technology plays a crucial role in the industry, protecting sensitive financial and personal data will be essential. Work security and potential for redundancy (P1, P2, P3, P4, P6, P7, P8, P9, P10, P11, P13, P14) are additional looming concerns for CAs, as their roles in organisations are going to be reduced because of the automation of specific tasks. This perception aligned with previous research that has discussed the impact of automation on traditional accounting tasks (Faizal et al., 2022).

Limitations

Generally, the limitations of this research are anchored in the choice of theories applied, as well as in the methodologies, such as the potential sampling bias, based on purposeful sampling (Johnson et al., 2020; Smith & Noble, 2014), the subjectivity and social desirability bias (Austin & Sutton, 2014; Haven & Van Grootel, 2019) and limitations because of the researchers' perspectives (Kim et al., 2019). The limitations were addressed through reflexivity and intersubjective validation (Yin, 2016) of the researchers.

Practical implications

To navigate the continuously changing and developing landscape of technological evolution, it is of utmost importance that CAs remain curious and willing to learn. A positive attitude towards the implementation of new technologies in the workplace is highly important. They need an open mind, ask question, stay curious, conduct research and support others. For the CA profession to thrive in this dynamic 4IR environment, provisional CA bodies need to play a pivotal role in reshaping the future of CAs. This begins with developing comprehensive training programmes designed to equip new CA students and existing professionals with the knowledge and skills required to excel in an increasingly tech-driven field. This will then allow new upcoming CAs to be up-to-date and skilled in the technologies the profession is implementing and be aware of the changes that are coming in the future. Recognising the urgency of this task, changes in the Continuing Professional Development (CPD) programme must reflect the evolving needs of the profession incorporating modules dedicated to digital literacy and emerging technologies.

For CAs to stay relevant, the professional boards in each and every country need to stay up-to-date, adjust the CPD requirements and advance sociotechnological interaction within the profession. A collective understanding and awareness of the 4IR technologies and their impact on the profession need to be driven locally and globally. Educating and upskilling is crucial, fostering their readiness to embrace automation and AI. For CAs to navigate the opportunities and challenges associated with implementing 4IR technologies, their curiosity, commitment to continuous learning and proactive engagement with professional bodies are essential. This, coupled with CA awareness and understanding of the 4IR and technologies, will empower and ensure the continuation and relevance of the CA profession in future.

Conclusion and recommendations

The 4IR is undeniably changing the CA profession, bringing a transformative era characterised by many opportunities and developments. Automation and widespread technology usage have emerged as key pillars, fundamentally altering the profession. The automation of repetitive processes, the shifting of attention to high-risk issues and the incorporation of cutting-edge technology, such as AI, were all identified by CAs as having the potential to boost efficiency. In addition to saving money for enterprises, this efficiency frees up time for CAs to regain valuable personal time and promote a better work–life balance. Moreover, as the profession adapts to automation, new roles are created contingent upon acquiring new skills. Despite concerns about potential redundancies, the participants emphasised that CAs are well positioned to thrive in the evolving landscape, provided they embrace continuous learning and adapt to the changing dynamics of the 4IR. In this dynamic context, technology, efficiency, work–life balance, cost benefits, role creation and risk reduction together herald a transformative era for CAs, offering challenges and unprecedented potential.

Chartered accountancies believed that using technology to automate processes is important. This impression was consistent with current literature, which described the 4IR as a technological revolution that could automate and streamline several activities. Participants believed that the automation brought on by the 4IR may increase productivity and let CAs devote more time to essential facets of their jobs. However, several participants voiced concerns about

the 4IR's potential impact on the CA profession, echoing previous research on change-averseness in the accounting industry.

Additionally, CAs believed that the 4IR offers benefits, including enhanced work–life balance, risk reduction and increased productivity. These benefits are consistent with the literature, which emphasises the automation and simplification of work as core advantages of the 4IR. The potential for CAs to achieve a better work–life balance because of higher productivity is an intriguing discovery that has not received much attention in the literature. These findings shed new light on the reasons for embracing the 4IR. Concerns raised by CAs included privacy, the need for updated training and competencies, and the stress of job redundancy. These findings support existing studies exploring the possible drawbacks of the 4IR for the CA profession, highlighting the significance of addressing these issues throughout the profession's transition.

Future research should focus on the following three areas: longitudinal studies to track the long-term impact of the 4IR, exploring regional and sectoral nuances in education and training requirements, and examining professional bodies' role in technology adoption among CAs. These research directions will enhance the understanding of the evolving CA profession in the 4IR era.

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C.B. and C.-H.M. conceptualised the study and C.B. conducted the study and wrote the original draft. C.-H.M. was the supervisor of C.B.; R.M.O. reviewed and edited the article.

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Data availability

The data that support the findings of this study are available from the corresponding author, C.-H.M., upon reasonable request.

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