



## The accounting revolution unveiled: Ghanaian academics' perspectives of the fourth industrial wave's disruptive power

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### Abstract

This article presents the results of a study conducted to examine the influence of the fourth industrial revolution (4IR) on the accounting profession, focusing on the viewpoints of accounting academics in Ghana. The study adopted a qualitative research approach, collecting primary data through interviews. The data were then thematically analysed. The study reveals that 4IR technologies have become increasingly feasible for organisations of all sizes in Ghana, in the preparation and communication of financial information. However, the study suggests that the use of 4IR technologies is not expected to lead to significant job redundancies within the accounting profession in Ghana. To remain competitive, accountants should enhance their skills in information and communication technologies (ICT) through continuous professional development programmes, enabling them to overcome any challenges presented by the 4IR. The study also emphasises the importance of integrating various accounting technologies appropriate for the 4IR work environment into the curriculum of higher education institutions, and promoting innovative teaching and learning methods. This study provides valuable insights into the perceptions of accounting academics in Ghana on the impact of the 4IR on the accounting profession, offering recommendations to higher education institutions on effectively training accounting graduates to thrive in the 4IR work environment.

### Keywords

accounting academics; accounting curriculum; accounting profession; fourth industrial revolution; information and communication technology

### Introduction

The development of relevant skills among newly qualified accounting graduates in Ghana and other African countries for effective functioning and success in the fourth industrial revolution (4IR) work environment appears to be slow (Gartoumi & Tekouabou, 2024; Mbizi, et al., 2022). 4IR is a term used to describe the current period of rapid technological advancement, characterised by the integration of advanced technologies, such as artificial intelligence (AI), blockchain, and the Internet of Things

(IoT), into various aspects of society and business (Cascio & Montealegre, 2016; Gaviria, et al., 2022). Studies indicate that the world is in the 4IR (see, for instance, Lydon, 2020; Nabi & Zohora, 2022; Schintler, 2022; World Economic Forum (WEF) 2018). The integration of 4IR technologies into business processes and the accounting profession has brought about changes in the role of accountants and their skills requirements (Daff, 2021).

The accounting profession has traditionally been associated with tasks such as bookkeeping, financial reporting and auditing. However, with the advent of the 4IR, accountants are increasingly expected to analyse complex data, use advanced software tools and provide strategic advice to businesses in a timely manner (Özcan & Akkaya, 2020). The study of Fernandez and Aman (2018), on impacts of robotic process automation (RPA) on global accounting services, shows that many accounting functions usually performed manually, including bank reconciliations, sales ordering and invoicing, management of inventory and payables or receivables, and many others, are currently being performed by software speedily, less costly and with minimal material misstatements. In auditing, software is applied to repetitive and manual tasks such as internal control testing, detail testing and compilation of audit test results (Moffitt, et al., 2018). Similarly, studies (Putrevu & Mertzanis, 2024; Coutinho et al., 2023; Fox & Signé, 2021) report that 4IR technologies, such as blockchain technology and biometric identification, are being used to transform payment systems to allow international payments and remittances to be made directly without intermediaries in Africa, thereby reducing transaction costs substantially (Putrevu & Mertzanis, 2024; Rühmann et al., 2020).

Many organisations prefer the use of computer software to manual labour to perform various functions, including accounting. Consequently, the large number of newly graduated accountants would have to compete for limited available vacancies (Handoko, et al., 2019). Already, studies have shown that accounting graduates, especially those without adequate information and communication technology (ICT) skills, who cannot utilise these skills to derive and interpret accounting information accurately, are struggling to obtain employment (Daff, 2021; Mooney, 2020). To transform the accounting profession in Ghana to be nationally and internationally accepted, it is necessary to incorporate 4IR technologies in the training of accountants.

Accounting academics play a vital role in preparing future professionals for the evolving demands of the accounting profession (Ghani et al., 2023). However, research examining how accounting academics in Ghana perceive the impact of the 4IR remains limited, particularly in relation to the digital skills accountants need to remain relevant in a technology-driven environment. Similarly, studies exploring how accounting education can effectively respond to the challenges and opportunities of the 4IR are scarce, not only in Ghana, but also in countries such as Australia, New Zealand, and Indonesia (Bowles et al., 2020; Handoko et al., 2019).

While the Institute of Chartered Accountants (Ghana) (ICAG) increasingly expects universities to embed digital competencies and emerging technologies into accounting programmes, stronger partnerships between universities and professional bodies are still needed to fully align academic training with industry requirements. This gap raises concerns about whether accounting academics are sufficiently equipped to design curricula that address the realities of technological disruption. Without a clear understanding of how the 4IR is transforming accounting work, there is a risk that graduates may leave university without the critical digital, analytical, and problem-solving skills required in the modern workplace, widening the skills gap and limiting the profession's capacity to adapt.

Although existing literature widely discusses the general impacts of the 4IR on business and accounting globally, including the disruptive effects of automation, AI, and big data on routine accounting tasks (Frey & Osborne, 2017; Warren et al., 2015), few studies have critically explored how accounting academics, particularly in developing countries like Ghana, perceive and respond to these changes. Much of the research focuses on technological adoption by firms (Moll & Yigitbasioglu, 2019) or the technical skills accountants need (Appelbaum et al., 2017), but there is limited evidence on how

well higher education systems, academic staff, and curricula are evolving to address the skill gaps and opportunities created by the 4IR. Furthermore, there is a lack of context-specific research examining whether Ghanaian universities' accounting programmes adequately integrate emerging technologies and critical thinking skills to prepare graduates for the new demands of the 4IR workplace (Gyekye & Amo, 2024). This gap is significant because the perspectives and readiness of academics directly influence curriculum design, teaching methods and ultimately graduate employability in a technology-driven profession. Therefore, this study, through a qualitative approach, brings to the fore accounting academics' perspectives of the impact of the 4IR on the accounting profession, specifically in a developing country such as Ghana. In this regard, the study provides answers to the following research questions:

1. What is the level of awareness among accounting academics about the 4IR and its potential impact on the accounting profession?
2. What are the views of accounting academics on the changing role of accountants in the 4IR era?
3. What are the perceived challenges and opportunities associated with the 4IR for the accounting profession, as identified by accounting academics?
4. To what extent are accounting academics incorporating the 4IR into the accounting curricula and training programmes?

This article contributes to the 4IR and accounting profession debate from the perspective of a developing country. It also provides insights into the knowledge and skills required by accounting professionals in the 4IR era, and informs the development of relevant curriculum, training programmes and policies that ensure that the accounting profession remains relevant and effective in the face of technological change. The article is organised as follows: a literature review and theoretical framework research methodology, findings and discussions. These are followed by the conclusion, implications, limitation and suggestions for further study.

## Literature review

### The fourth industrial revolution

The term '4IR' lacks a universally accepted definition within the existing literature (Özcan & Akkaya, 2020). The 4IR builds on three earlier industrial revolutions that have transformed human societies and economies over the past three centuries. The First Industrial Revolution began in the late 18th century, driven by the mechanisation of production through innovations such as the steam engine and mechanised textile manufacturing. The Second Industrial Revolution, spanning the late 19th and early 20th centuries, was characterised by mass production, the widespread use of electricity, and advancements in steel and chemical industries. The Third Industrial Revolution emerged in the mid-20th century with the advent of digital technologies, automation, and information and communication technologies, marking the transition from mechanical and analogue processes to digital systems (Lee & Lee, 2021; Skilton & Hovsepian, 2018).

According to Dean and Spoehr (2018), the 4IR refers to a global context characterised by a diverse range of interrelated digital technologies, showcasing significant advancements in computing power and the dexterity to connect data processing devices. Liu and Xu (2016) define the 4IR as the revolutionary change that occurs when information technology (IT) proliferates in all industries. The 4IR encompasses a wide range of concepts, including digitalisation, automation, standardisation, dynamic and secure networks, as well as incremental developments in mechanisation and general innovation (Ustundag & Cevikcan, 2018). Davies (2015) highlights that the 4IR heavily relies on several innovative technological advancements, such as the utilisation of ICT to digitise information and integrate systems throughout the entire product, and service development lifecycle. It also

encompasses the employment of cyber-physical systems, which leverage ICTs for monitoring and controlling physical procedures and systems; network communications, collecting, analysing and utilising large volumes of data; and improved ICT-enabled support for employees, comprising robots and intelligent equipment (Oztemel & Gursev, 2020).

### **The 4IR in Ghana**

Ghana, like other African countries, is adopting digital technologies to enhance efficiency and human capital development (Senyo, et al., 2021). In Ghana, although there is no single comprehensive policy dedicated solely to the 4IR, several national strategies indirectly support its integration. The ICT for Accelerated Development (ICT4AD) Policy, the Ghana Digital Economy Policy (2020–2030) (Yawson, 2024), and recent Science, Technology, Engineering and Technology (STEM) and Technical, Vocational, Education and Training (TVET) (Commission for Technical and Vocational Education and Training (CTVET), 2021) reform all promote digital skills, infrastructure, and technology adoption across sectors. These frameworks aim to modernise education and business practices, which creates an enabling environment for 4IR technologies like AI, automation, and big data to influence professions such as accounting. However, practical gaps remain, as universities and professional bodies must translate these broad policies into curriculum updates and skills training to ensure graduates are ready for the demands of the digital economy (Gyekye & Amo, 2024). Inadequate ICT infrastructure, including internet connectivity, continues to hinder training institutions' ability to effectively equip graduates and professionals with the digital skills required by employers (United Nations Educational, Scientific and Cultural Organisation (UNESCO), 2021). In addition, most academics may require specific training to upsurge their knowledge and capacity in ICT, to enhance digital learning and close the technology skills gap among accounting graduates (Matthess & Kunkel, 2020; UNESCO, 2021). In the Ghanaian context, we still believe that there is much to be learnt, especially from accounting academics' perspectives about the disruptions of 4IR technologies to the accounting profession and strategies to be adopted to train accountants to satisfy the needs of employers and society.

### **Implications of the 4IR in universities/higher education**

The 4IR is transforming the mission and practices of universities and higher education institutions worldwide. As emerging technologies such as AI, automation, big data, and the IoT reshape the labour market, universities must adapt by modernising curricula and teaching approaches to ensure graduates are work-ready (Schwab, 2017). Traditional content-heavy programmes are no longer sufficient; instead, students need digital literacy, data analytics, and higher order skills such as critical thinking and problem-solving (Howieson, 2003; Moll & Yigitbasioglu, 2019).

The 4IR also increases the need for interdisciplinary education, requiring universities to design flexible programmes that integrate technology, business, and ethics (WEF, 2020). Teaching methods must evolve as well, using digital tools and blended learning to create more flexible, student-centred experiences (Penprase, 2018). Another important implication is the growing demand for lifelong learning opportunities, including micro-credentials and short courses that help professionals continually update their skills (Organisation for Economic Co-operation and Development, 2019).

However, these opportunities come with challenges, especially in developing countries like Ghana, where infrastructure limitations and unequal access to digital tools can widen the education gap if not addressed (Gyekye & Amo, 2024). Overall, the 4IR calls for universities to rethink how they equip graduates, collaborate with industry, and support inclusive access to digital learning so that higher education continues to drive development in a technology-driven world.

### **The 4IR and the accounting profession**

The 4IR is disrupting industries across the globe at unprecedented speeds. Schwab (2016) asserts that while the computerisation of accounting began in the 1990s with the introduction of accounting

software during the Third Industrial Revolution, the profound and disruptive impact of the 4IR on the profession has accelerated significantly in the past decade. Since then, the profession has been experiencing significant transformations owing to various technologies including cloud computing, data analytics, blockchain and AI, which have increasingly influenced the work of accountants. In the realm of the accounting profession's transformation, these disruptions not only affect the professional activities performed by accountants, but also their interactions with clients (Bowles et al., 2020). Traditional accounting functions, such as auditing, taxation and consultancy, are evolving into non-traditional roles, such as Financial Data Analysts, Systems Accountants and Systems Auditors reflecting the impact of the 4IR (Bowles et al., 2020; Nyambo, 2020).

According to Frey and Osborne (2017), the 4IR provides opportunities for individuals, especially accountants, who are willing to embrace it. Rkein., et al. (2020) suggest that new work opportunities will emerge, requiring a different skill set, particularly jobs that involve higher-order thinking. Villanova (2019) emphasises that the 4IR will unleash the business, managerial and entrepreneurial skills of accountants, thereby emancipating them from the mundane and repetitive tasks that currently occupy most of their time. As noted by Islam (2017), the 4IR will have a significant impact on the accounting profession and professional accounting organisations, especially in developing countries, necessitating responses from their members and training institutions. Going forward, professional accountants will use more sophisticated and advanced technologies to enhance their conventional working methods (Islam, 2017).

Surianti (2020) suggests that the 4IR will enable accountants to easily access quality data from various sources, which were previously difficult to access in a timely manner. This will facilitate effective planning and decision-making by managers and other stakeholders. Additionally, the 4IR will also enhance the relevance and credibility of financial reporting, through the use of self-checking and self-Auditing systems (Mohamed, 2018). Similarly, Ghani (2019) posits that with the advent of the 4IR, accountants will need to focus more on the bigger-picture strategies of companies, emphasising the importance of embracing the changes and being well versed in the use of the latest technologies to remain in high demand (Akhter, 2018).

The 4IR, driven by digital technologies, is anticipated to result in a significant reduction of the labour force, potentially leading to higher unemployment rates, particularly among accounting graduates worldwide (Fernandez & Aman, 2018; Frey & Osborne, 2017). While Sommer (2015) estimated that, approximately 23 million jobs worldwide would be lost by 2030, due to these technological advancements, the WEF predicted that by 2028, more than 40% of accountants worldwide currently engaged in routine accounting and payroll tasks could face the risk of losing their current employment as a result of the 4IR (WEF, 2018).

Furthermore, students currently in tertiary education may face challenges finding employment in their respective fields of study (Omar & Hasbolah, 2018). This may be attributed to the widespread adoption of technology-based equipment, such as RPA, which enables more efficient and faster execution of various business and administrative tasks compared to human capabilities. Lacity and Willcocks (2016) define RPA as software that uses technology-based equipment to automate processes and tasks. RPA imitates the human worker, aiming to expedite structured work in a cost-effective manner (Asatiani & Penttinen, 2016). The impact of RPA on the accounting profession is particularly significant as it automates the manual manipulation of accounting data, a task which accountants traditionally performed manually (Fernandez & Aman, 2018).

### **The 4IR and employability**

The profound technological development due to the 4IR is creating new demands for knowledge, skills, and competencies that shape employability in the 21st-century workplace (Schwab, 2016). In the accounting profession and other knowledge-based sectors, technical knowledge alone is no longer sufficient. Scholars agree that digital literacy has become a fundamental competency, as professionals



must understand how to use, interpret, and critically assess digital tools and systems (Howieson, 2003). For accountants, this includes proficiency in cloud accounting, data analytics platforms, and AI-enabled audit and reporting tools (Moll & Yigitbasioglu, 2019).

Equally critical is the development of data analytic skills, which enable professionals to handle large and complex datasets, extract meaningful patterns, and generate actionable insights for decision-making. Warren et al. (2015) and Sun et al. (2024) argue that big data analytics is reshaping accounting work by shifting the focus from historical reporting to predictive analysis and strategic advisory functions. This requires graduates to be comfortable with statistical techniques, data visualisation, and data-driven problem solving. Beyond technical skills, the 4IR highlights the importance of higher-order cognitive skills such as critical thinking, problem-solving, and adaptability. Frey and Osborne (2017) emphasise that routine tasks are increasingly automated, placing a premium on human skills that machines cannot easily replicate, such as the ability to evaluate complex scenarios, make sound judgments, and adapt to rapidly changing work contexts.

In addition, the 4IR demands strong interpersonal and communication skills, as collaboration across teams and disciplines is vital in a technology-rich work environment. As noted by Al-Htaybat and von Alberti-Alhtaybat (2017), accountants and other professionals must be able to explain complex analytical findings clearly to non-technical stakeholders and contribute to strategic discussions that extend beyond their traditional roles. Furthermore, in line with DIT a mindset of continuous learning is now essential for maintaining employability, as technological tools and practices evolve quickly (WEF, 2020). Professionals are expected to engage in lifelong learning and upskilling to stay relevant and competitive in the labour market.

To enhance the employability of their graduates during the 4IR, higher education institutions should modify their existing course contents or introduce new courses to develop the digital skills that employers will require (Dziubaniuk, et al., 2023; Hoffman, 2017). Higher education institutions should also invest in technology for practical training and skills development, providing students with hands-on experience that considers the requirements of the 4IR (Islam, 2017).

## **Theoretical framework**

### **Disruptive Innovation Theory**

The Disruptive Innovation Theory (DIT) provides the framework for examining the 4IR and its disruptive impact on the accounting profession in Ghana. Originally introduced by Christensen (1997), DIT explains how new technologies can fundamentally alter industries by displacing established products, services, or practices with more innovative, efficient, or accessible alternatives. Disruptive innovations typically emerge at the lower end of the market or in new, underserved segments. Over time, they evolve in capability and performance, eventually overtaking incumbent solutions and reshaping entire industries (Christensen et al., 2015). In the context of the accounting profession, technological advancements such as AI, RPA, blockchain, and big data analytics represent forms of disruptive innovation with the potential to transform how accounting services are delivered (Issa et al., 2016).

Several scholars have highlighted the relevance of DIT to professional services. For instance, Suddaby et al. (2009) argue that disruptive forces can challenge traditional professional logics, compelling accountants to adapt their roles and reconfigure their professional identities. Similarly, Appelbaum et al. (2017) emphasise that emerging audit technologies such as continuous auditing and AI-driven analytics are not merely tools for efficiency but catalysts for redefining the nature and boundaries of accounting work. The disruptive effects of the 4IR on accounting education are also increasingly discussed in the literature. Moll and Yigitbasioglu (2019) note that digital disruption is reshaping the competencies required of future accountants, calling for significant curriculum reforms. According to their study, accounting academics must respond proactively by embedding digital literacy, data

analytics, and critical thinking into their teaching to ensure graduates remain relevant in a rapidly changing work environment. Similarly, Warren et al. (2015) argue that automation and data-driven technologies can render traditional routine tasks obsolete, shifting accountants' roles towards more strategic, interpretive, and advisory functions.

Applying DIT to the Ghanaian context is especially timely, as the local accounting profession faces global technological trends alongside unique local challenges such as limited digital infrastructure, resource constraints, and varying levels of institutional readiness (Ofosu-Asare, 2024). By examining Ghanaian accounting academics' perspectives through this theoretical lens, this study seeks to understand how these academics interpret, adapt to, and prepare for disruptive technological change, with the ultimate aim of training competent accountants.

## Methods

The study employed a qualitative research methodology to deeply explore academics' perspectives of the impact of the 4IR on the accounting profession in Ghana, enabling participants to openly share their experiences and respond to diverse questions on the phenomenon under consideration (Creswell & Creswell, 2018). The primary data was collected through interviews with ten accounting academics from five universities in Ghana offering accounting programmes to ensure diverse institutional perspectives, while balancing practical constraints such as time, access, and feasibility. During the process, it became clear that by the tenth interview, no substantial new themes were emerging, indicating thematic saturation had been reached. Six of these accounting academics are registered members of the ICAG. As of March 31, 2021, Ghana had ten accredited public universities providing diverse four-year accounting degree programmes, including options like Bachelor of Science (BSc) in Accounting, Bachelor of Commerce Degree (BCom) in Accounting, and Bachelor of Business Administration (BBA) in Accounting (Ghana Tertiary Education Commission (GTEC), 2021). It is important to note that these programmes are accredited by GTEC rather than by any professional accounting body. The study focused on these universities because they enrol the most business students.

The participants were selected using purposive sampling, targeting individuals with more than four years of relevant experience in both accounting teaching and industry practice to provide insights on the research questions. The researchers obtained ethics approval from the Ethics Review Committee of the College of Accounting Sciences of the researcher's university of study. Also, permissions were obtained from the employers of the research participants, in addition to individual participant's consent. A semi-structured interview schedule, based on the study objectives, was developed to collect the data. To ensure quality and trustworthiness for this study, the researchers ensured that research questions were clear and focused. Prior to data collection, the interview schedule was pilot tested with experienced accounting academics to ensure the questions were clear, relevant, and easy to understand. This process helped to identify any confusing items and confirmed that the questions effectively captured the intended information to answer the research questions. Feedback from the pilot test was used to refine the interview schedule, enhancing its overall reliability and validity (Gani, et al., 2020).

The responses were recorded using an electronic audio recorder and then transcribed verbatim. Thematic analysis procedures were employed to analyse the data, which involves identifying, analysing and interpreting important themes within qualitative datasets to address the research questions (Clarke & Braun, 2017; Erlingsson & Brysiewicz, 2017). The study used an inductive approach to let themes and meanings emerge naturally from the data, allowing findings to reflect participants' perspectives without preconceived ideas (Alhojailan, 2012). For this exercise, qualitative data analysis software ATLAS.ti™ version 9 was used.

To ensure the credibility of the results, the researchers evaluated how well the categories that emerged covered the data and identified whether there were similarities and differences between categories.

## Findings and discussion

The analysis of the demographic data revealed that all participants had more than four years of teaching and industry experience. In addition to their academic qualifications, a considerable number had professional accounting qualifications. The participants were given pseudonyms in place of their real identities to maintain anonymity and confidentiality, with two letters and a number representing the individual academics (e.g. AS1, AS2 etc.), followed by a code for the university they were from (e.g. U1, U2, U3, U4, U5).

The thematic analysis of the data produced four major themes in relation to the research questions: (1) the 4IR and the accounting profession; (2) the 4IR and the changing role of accountants; (3) challenges and opportunities associated with the 4IR; and (4) recrafting the accounting curriculum towards 4IR. While only a subset of participant quotes is presented under each theme, these were selected for their clarity and representativeness. Similar views were expressed by other participants, reflecting strong thematic convergence across the dataset.

### The 4IR and the accounting profession

In relation to the first research question - 'What is your level of awareness about the 4IR and its potential impacts on businesses and the accounting profession?', the majority of participants recognised the reality of the 4IR due to the rapid developments in technologies to enhance the production of goods and services across all sectors of the economy. Interviewee AS1U4 noted the following points:

*In terms of the 4IR, there are many different aspects we can talk about. We have the AI where machines do things, blockchain, IoT and how they affect the work environment, the accounting profession and human lives in general. We have moved away from the traditional way of [now]doing virtually everything. We have gone on to the internet, there is cloud accounting and all those kinds of things. In fact, there are new businesses coming in that direction, new ways of financial reporting, new types of assets and liabilities and expenses that are exposed in that environment (AS1U4).*

Another participant pointed out that

*The 4IR is more of AI, the robotic way of doing things. The issue is about going beyond the normal 3G or 4G issues into a system where we analyse and transfer huge data with speed. Already some businesses are operating in the computer environment. The big businesses coming from outside have that business culture already. They use accounting software with in-built reporting solutions that execute routine financial record keeping and produce financial statements more accurately, efficiently and timely. It is not a faraway thing that we are hearing. So as academics, we give talks about those changes to at least create the awareness (AS2U2).*

Concerning the impact of the 4IR on the work of accountants in Ghana, almost all participants remain certain that it may take some years before any significant impact would be noticed. In the opinion of AS2U3:

*To some extent, accounting tasks, especially those that are routine in nature may be taken over by robots, but I will be quick to say that there is a limit to that fact. Because the data generate by the robots must be analysed and interpreted for decision making and this is where the accountant comes in (AS2U3).*



Arguing in support of participant AS2U3, AS1U5 stated that:

*You can have the system automatically recording, processing also goes to the extent of producing your financial statements for you once you input your charts of accounts and the rest, but the system cannot interpret it, and that is the essence of the accountant's work. You do not expect the robotics to give us a detailed examination of the elements in the financial statements and put meanings into it. So, no matter what they do, the 4IR cannot take away the work of accountants, at best it can facilitate the work of the accountant; it is not a substitute. In fact, we do not have to think about it (AS1U5).*

Another participant further commented:

*The small businesses around do not want to go that proper way of data generating and processing. They still do paper-based accounting because they would be required to pay more amount of tax. So yes, the positives in the machines being used by the accounting profession are there, but some business owners may not actually want to go that way. Therefore, I think in our part of the world, accountants would not be so much affected by the 4IR (AS1U3).*

The findings from this study indicate a growing awareness among Ghanaian accounting academics about the 4IR and its emerging impact on the accounting profession. This finding confirms the study of Ti et al. (2024), that there is a high level of awareness of the impact of the 4IR on the accounting profession among academics in another developing country, namely South Africa. Participants recognised that rapid advancements in technologies-such as AI, blockchain, cloud computing, and the IoT are already reshaping business operations and transforming how accounting tasks are executed. As noted by AS1U4 and AS2U2, the shift towards automated systems, intelligent software, and cloud-based solutions is no longer theoretical; it is actively shaping organisational practices, especially among technologically advanced or multi-national firms. These observations align with the growing literature on the disruptive potential of the 4IR in professional services. Scholars such as Appelbaum et al. (2017) highlight how AI and automation are streamlining routine accounting functions such as transaction processing, reconciliation, and report generation. However, they also emphasise that these technologies enhance rather than eliminate the role of accountants, by freeing them to focus on higher-level functions like data interpretation, strategic planning, and advisory services.

These perspectives were further supported by participants AS2U3 and AS1U5, who argued that while automation may replace repetitive tasks, it cannot replicate the interpretive and judgment-based aspects of accounting. This reflects the broader academic consensus that human judgment remains central to financial decision-making and ethical evaluations (Moll & Yigitbasioglu, 2019; Warren et al., 2015). However, the participants also acknowledged the uneven pace of 4IR adoption across sectors in Ghana. As AS1U3 pointed out, many small businesses still rely on manual, paper-based systems, partly due to a lack of digital infrastructure. This reinforces findings by (Gyekye & Amo, 2024) who observe that while 4IR awareness is rising in Ghana, practical adoption is hindered by institutional, economic, and behavioural constraints.

### **The 4IR and the changing role of accountants**

Responding to the question 'What skills and competencies do accountants need to survive in the 4IR work environment?', participants were unanimous that as a matter of necessity, current and future accountants must develop skills such as data analytics, digital literacy and critical thinking to be able to survive in the 4IR work environment. One participant specifically stated:

*Data analytics is becoming increasingly important in the accounting profession as accountants use data to gain insights into business performance, identify areas of risk, and detect fraud. Digital literacy is also becoming increasingly important as businesses move*

*towards automation and digitalisation. Critical thinking is important in identifying and solving complex problems that arise in the new business environment (AS2U5).*

Another participant expounded:

*Because automation and AI are changing the way accounting services are delivered, the profession will need accountants who can effectively demonstrate skills in data analytics to identify areas of risk and fraud (AS1U2).*

In addition to the data analytics, digital literacy and critical thinking skills are required by accountants for effective functioning and success in the 4IR work environment. According to participant AS2U5, critical thinking skills include 'the ability to think outside the box, applying a critical and analytical mindset to problem-solving in the workplace.' Similarly, AS1U4 described critical thinking skills as 'the ability to analyse and solve complex problems in the workplace' and 'many accounting graduates continue to lack these essential skills.' This implies that both soft and ICT skills, must be developed simultaneously to meet contemporary professional demands. Participant, AS2U2 emphasised that

*The 4IR will require accountants who are business minded, data inclined, and are more into marketing. The impact is a shift from the normal core of preparation of financial statements to more business understanding, value addition and more collaborations when it comes to the 4IR (AS2U2).*

Concerning research question two, the study's findings confirm that Ghanaian accounting academics widely recognise that the 4IR is reshaping the skills and competencies required of accounting professionals. Participants emphasised that traditional accounting tasks alone are no longer sufficient in a digitalised, automated work environment. Instead, they argued that accountants must develop new capabilities such as data analytics, digital literacy, critical thinking, and broader business acumen to remain relevant and add value in the 4IR context.

This perspective aligns strongly with the extensive body of literature that has highlighted the changing nature of accounting work due to technological disruption. Frey and Osborne's (2017) study on the future of employment identifies accounting as one of the professions where routine tasks are most susceptible to automation, underscoring the need for accountants to shift towards tasks that require complex judgment, interpretation, and decision-making. Supporting this, Warren et al. (2015) argue that the rise of big data means accountants must increasingly be able to collect, analyse, and interpret large and complex data sets to generate meaningful insights for management and stakeholders.

As participant AS2U5 noted, data analytics is now crucial for risk identification, fraud detection, and performance analysis. This reflects the position of Appelbaum et al. (2017), who point out that advanced analytics tools can enhance auditors' and accountants' ability to detect anomalies and support more proactive assurance. However, they also stress that using these tools effectively requires accountants to possess both technical data skills and the critical thinking needed to interpret results in context. Participants also highlighted digital literacy as an indispensable skill. Moll and Yigitbasioglu (2019) argue that accounting professionals must become comfortable using emerging technologies such as cloud computing, AI-driven systems, and automated reporting tools, which are transforming how financial data is processed and presented. Without digital competence, accountants' risk being left behind as firms adopt increasingly sophisticated technology to stay competitive.

Another important insight from the majority of participants is the emphasis on critical thinking and broader business orientation. Participant AS2U2 stressed that the 4IR shifts the accountant's role from simply preparing financial statements to acting as a business partner who understands strategy, adds value, and collaborates across functions. This resonates with Howieson's (2003) early observation that future-ready accountants must move beyond routine compliance to advisory roles that demand strategic insight, creativity, and problem-solving abilities. Additionally, Al-Htaybat and von Alben (2017) reinforce this by arguing that automation frees accountants from repetitive work,

allowing them to focus on tasks that involve professional judgment and add value for clients and organisations. However, this shift requires deliberate skills development through education and training to build accountants' capacity for complex analysis, critical thinking, and communication.

### Challenges and opportunities associated with the 4IR

The third research question sought the perception of the academics on the challenges and opportunities associated with the 4IR for the accounting profession. As reported in the literature (Frey & Osborne, 2017; Rkein et al., 2020; Villanova, 2019), the research participants acknowledged that the 4IR presents several challenges and opportunities to the accounting profession, which accountants need to be aware of and take advantage of in order to remain competitive. With reference to the opportunities, AS2U5 confirmed that

*The 4IR will help businesses to acquire large data, manage the data and be able to make better predictions, do better security analysis and have a competitive edge.*

On the part of participant AS103,

*The 4IR presents opportunities for the accounting profession. For example, data analytics can be used to gain insights into customer behaviour, which can be used to develop new products and services. AI can be used to automate routine accounting tasks, freeing up time for accountants to focus on more strategic activities. Accounting education needs to equip graduates with the skills required to take advantage of these opportunities.*

Concerning the challenges associated with the 4IR, one participant noted the challenge of attracting and retaining talents for the accounting profession. The participant explained that

*The 4IR has created a demand for individuals with specialised skills, such as data analysts and cybersecurity experts. Universities and accounting firms will need to compete with other industries to attract and retain talent with these skills. This means that accounting education needs to offer more specialised courses that reflect the needs of the industry (AS1U1).*

The findings of this study confirm that Ghanaian accounting academics widely recognise the 4IR as a double-edged force, presenting both significant opportunities and notable challenges for the accounting profession. This aligns with existing literature, which consistently highlights that digital transformation, automation, AI and big data analytics are reshaping professional roles, required skills, and value propositions in accounting (Frey & Osborne, 2017; Rkein et al., 2020; Villanova, 2019).

Most participants in this study emphasised the vast opportunities that the 4IR brings to the profession, especially through data-driven decision-making and automation. For example, participant AS2U5 pointed out that the 4IR will enable businesses to gather and manage large volumes of data more efficiently, enhancing predictive capabilities and security analysis. This reflects the observations by Warren et al. (2015), who argue that big data analytics can strengthen organisational competitiveness by turning raw data into actionable insights.

Similarly, Moll and Yigitbasioglu (2019) found that advanced data analytics tools provide accountants with the means to move beyond compliance and reporting tasks towards strategic advisory roles. Further reinforcing this view, AS1U3 highlighted how AI and automation can relieve accountants of repetitive tasks, freeing them to focus on higher-order responsibilities such as strategic planning and business development. This is consistent with the arguments made by Appelbaum et al. (2017), who emphasise that automation does not eliminate the need for accountants but rather redefines their roles, requiring them to add value through interpretation, analysis and strategic thinking. The ability to leverage AI and analytics to gain insights into customer behaviour, as noted by many participants, echoes the broader call for accountants to become more involved in business decision-making processes (Sutton et al., 2016). However, the opportunities of the 4IR also come with substantial

challenges, particularly regarding talent development and retention. As highlighted by AS1U1, there is a growing demand for specialised skill sets such as data analytics and cybersecurity, which are not traditionally emphasised in accounting curricula.

This finding is well supported by Frey and Osborne's (2017) study on automation risk, which shows that routine accounting tasks are among the most susceptible to automation, making upskilling essential to ensure employability and relevance. Furthermore, Rkein et al. (2020) argue that attracting talent with advanced technological capabilities is increasingly competitive, as other industries also seek data science and cybersecurity experts. This means that accounting programmes must adapt by integrating more specialised courses and practical training to align with industry demands. Without these curriculum reforms, there is a risk that accounting graduates may lack the competencies needed to leverage the full potential of 4IR technologies (Gyekye & Amo, 2024).

### **Recrafting the accounting curriculum towards 4IR**

Addressing the fourth research question 'To what extent are accounting academics incorporating the 4IR into the accounting curricula and training programmes?' the interviews data revealed that the accounting profession is undergoing significant changes and accounting educators need to ensure that graduates are equipped with the skills required for the future. For instance, one participant stated:

*Accounting education needs to adapt to the new reality and provide students with a curriculum that reflects the needs of the industry. Many entities are progressing toward the realm of the 4IR, yet the majority of our trainees remain unaware of this advancement due to its absence from our current curriculum. It is worth noting that we do not teach cloud accounting in this university. Industry is moving very fast, but the training is slow. So, it is a gap, and we need to catch up (AS1U4).*

Another participant captured the need to recraft the Ghanaian accounting curriculum as follows:

*We need to rethink the whole accounting curriculum. What the world will need in the next 20 years, for me, is not the kind of things we are teaching our students today. The kind of graduates that we are producing today are book knowledge graduates and not skills-oriented graduates. There is a need to have a revolution of minds through a critical process in order to make the demands of the 4IR part and parcel of the accounting curriculum. Because the mindset of some people is that accounting should be debits and credits. We need to have much more critical thinking in order to question the orthodox way of the accounting process and that will require certain skills to be included in the accounting curriculum (AS2U4).*

Participants, undeniably, require a curriculum that would satisfy the skills needs of accounting graduates for employment. A study by Kwarteng and Mensah (2022) reveals that accounting graduates in Ghana are deficient in critical skills, including computer skills for employment, due to a significant gap between what is offered by the universities and the skills needed by employers. Consequently, a new curriculum focusing on equipping accounting students with 4IR technology skills may fully prepare them for the labour market. As noted by AS2U4:

*An activity-based teaching and learning methods such as analysing case studies involving business situations, presentations and problem-solving approaches in addition to practical utilisation of computer technology can be employed by universities to provide opportunity to accounting students to discover principles, develop ICT skills, critical thinking and creativity.*

The study indicates that participant accounting academics in Ghana acknowledge an urgent need to overhaul existing accounting curricula to align with the realities of the 4IR. Participants highlighted a persistent gap between what universities currently teach, and the skills increasingly demanded by industry. As noted by participant AS1U4, the rapid technological advances shaping business practices

are not adequately mirrored in many accounting programmes, which still emphasise traditional bookkeeping approaches while neglecting emerging technologies such as cloud accounting and data analytics. This finding is consistent with a growing body of literature that has emphasised the misalignment between accounting education and the evolving competencies required in a digital era (Moll & Yigitbasioglu, 2019; Howieson, 2003). For example, Kwarteng and Mensah (2022) found that many accounting graduates in Ghana lack practical ICT skills and critical thinking capabilities, both of which are now essential for navigating technology-driven work environments. Their study underscores the pressing need for curriculum reforms to bridge this skill gap and better prepare graduates for an increasingly automated and data-intensive profession.

The participants call for a fundamental rethinking of what is taught and how it is delivered. As AS2U4 stressed, the current focus on rote learning and basic bookkeeping does not equip students with the critical thinking, creativity, and problem-solving abilities required to adapt to technological disruption. This observation aligns with the arguments of Al-Htaybat and von Alberti-Alhtaybat (2017), who contend that future accountants will need to complement technical accounting knowledge with higher-order skills such as analytical reasoning, digital literacy, and adaptability to continuous technological change.

Furthermore, the call for integrating activity-based teaching methods, case studies, and practical technology use reflects recommendations by Jackling and De Lange (2009), who advocate for more interactive and experiential learning approaches in accounting education to close the gap between theory and practice. Such pedagogical shifts are crucial for fostering the kind of mindset change that AS2U4 described: moving away from a narrow focus on 'debits and credits' towards a broader view of accounting as an evolving profession shaped by automation, big data, and AI (Warren et al., 2015). This analysis also resonates with the position of Shuhidan et al. (2023), who emphasise the need for educators to integrate emerging technologies, data analytics, and soft skills into accounting curricula globally. Without such curricular reforms, graduates' risk being underprepared for roles that now demand proficiency in using digital tools, interpreting complex data sets, and advising on technology-driven business strategies (Howieson, 2003).

## Conclusion

Previous studies suggest that many newly qualified accounting graduates in Ghana and other African countries are still developing the skills needed to thrive in the 4IR work environment at a relatively slow pace (Gartoumi & Tekouabou, 2024; Mbizi et al 2022). Through a DIT lens, this study examines the impact of the 4IR on the accounting profession. This study examines accounting academics' perspectives of the impact of the 4IR on the accounting profession in the Ghanaian context. Using a qualitative approach, data were collected through interviews with ten academics from five public universities in Ghana and analysed thematically. The study shows that the 4IR is fundamentally disrupting the accounting profession, creating both new opportunities and new demands for accountants in Ghana. To stay relevant, accountants must now combine technical accounting knowledge with strong digital skills, critical thinking, and the ability to deliver strategic insights alongside automated systems. These changes place greater responsibility on educators to update accounting curricula to include emerging technologies, data analytics, and activity-based learning that builds adaptable, work-ready graduates. While the pace of this transformation will depend on local contexts such as business culture and infrastructure, the role of accountants is not disappearing but evolving into one that adds greater value through analysis, interpretation, and informed decision-making in an increasingly digital world.

## Theoretical implication

This study contributes to the understanding of DIT by demonstrating how the 4IR is reshaping the accounting profession in Ghana. The findings show that technological disruption through automation,



AI, and big data does not simply eliminate accounting tasks but transforms them in ways that demand new skills, new thinking, and institutional adaptation. This supports the idea that disruptive innovation in professional services is not solely about replacement but about redefining roles and creating new value (Christensen et al., 2015). Situating these insights within the Ghanaian context, the study extends DIT to highlight how local factors such as curriculum design, infrastructure, and institutional readiness mediate the pace and impact of technological change. This aligns with calls for more detailed, context-sensitive applications of the theory that recognise how professions evolve differently across regions and sectors (Suddaby et al, 2009). In sum, this study shows that sustaining the relevance of the accounting profession in the 4IR era depends on how well professionals, educators, and institutions adapt together.

### **Practical implication**

The study also has important practical implications for accounting practitioners, accounting educators and professional accounting bodies in Ghana, and other emerging economies. There is the need for accounting practitioners to upgrade their skills in 4IR technologies to overcome any challenges that come with the 4IR, to remain competitive. Whilst current literature is saying it and academics agree, nothing seems to have changed in the curriculum in Ghana. Accounting educators need to speed up the changes to assist with the challenges graduates encounter. The study also revealed that although traditional accounting skills will still be important, accounting educators need to modify the accounting curriculum to focus on equipping accounting graduates with the skills required for the future 4IR work environment, including cloud computing, data analytics, digital literacy and critical thinking to provide value-added services. Consistent with the literature, strategies such as discussions, group work, problem-solving and practical utilisation of computer technology can be employed by accounting academics to effectively train graduates, to acquire the needed skills and competencies to survive in the 4IR work environment (Ackerman, 2019; Lewohl 2023; Sarkio et al., 2023). Professional accounting bodies also have a vital role to play by setting clearer standards for technology-related competencies, supporting curriculum updates, and providing guidance on lifelong learning and upskilling in specialist areas such as data analytics and cybersecurity.

### **Limitation and suggestions for further study**

One limitation of this study is that it focused only on the perceptions of accounting academics from five public universities in Ghana. A similar study, comprising accounting academics from private universities in Ghana and similar institutions in other countries can be undertaken, to provide a more comprehensive and international view on the impact of the 4IR on the accounting profession. Another study could potentially investigate the perspectives of accountants working in the professional sector or industry on the impact of the 4IR on the accounting profession. This may inform policies and strategies development in Ghana to train future accountants for the ever-changing world of technology. Also, this study employed a purely qualitative research methodology, which is perception-based. Future research could be conducted on the same area, using a quantitative research methodology to validate the findings of this study for accurate comparison. This study adds to accounting education literature by providing new insights on accounting academics in a developing country's perspectives of the impact of the 4IR on the accounting profession, and how local universities can innovatively strategies teaching and learning methods to adequately train accounting graduates to survive in the 4IR work environment.

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The authors have no competing interests to declare that are relevant to the content of this article.

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