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A Quadruple Helix Intervention for Accounting Education in Ghana

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Abstract. The current study explored the information and communication technology and higher-order thinking skills necessary for accounting students in Ghana upon completion of their accounting programme. These skills will improve their job prospects. The study adopted a qualitative approach involving in-depth semi-structured face-to-face interviews with government officials, accounting academics, employers and accounting graduates. The quadruple helix (QH) model of innovation was applied to examine the required information and communication technology and higher-order thinking skills and roles of the key QH stakeholders in promoting the development of these skills. Purposive and snowball sampling methods were utilised to select the participants for this study. The data were then analysed using thematic review procedures with the assistance of ATLAS.ti™ 9. The study revealed a growing need for accounting graduates to demonstrate creativity, analytical skills, an entrepreneurial spirit, and strong interpersonal skills for swift adaptation and success in the competitive professional landscape. Enhancing the employability of accounting graduates demands collaboration among government, academics, employers, and graduates, particularly by developing the curriculum and enhancing practical work-readiness.

Keywords: accounting graduates; employability; higher-order thinking; information and communication technology; quadruple helix model.

1. Introduction

In recent years, there has been a global decline in the employment of accounting graduates due to a shortage of essential employability skills, notably in information communication technology (ICT) and high-order thinking (HOT) abilities necessary for optimal workplace performance (Cohn, 2020; Daff, 2021; Tysiac, 2019). Employers are currently preferring candidates who are non-accounting graduates possessing strong ICT and HOT skills (Mooney, 2020; Tysiac, 2019). The Association of International Certified Professional Accountants (AICPA) reports that the employment of new accounting graduates experienced a 10% decline in 2020, after an 11% decrease from 2016 to 2018 (see Dawkins & Dugan, 2022). There was however an 11.7% rise in employment of non-accounting graduates in accounting-related jobs between 2018 and 2020 (AICPA, 2022; Dawkins & Dugan, 2022). This phenomenon understandably raises anxiety among many accounting graduates due to the perceived scarcity of employment opportunities after graduation.

The use of technologies, such as cloud computing, data automation, big data and data analytics, block chain, artificial intelligence, and cyber security has also affected accounting processes in many organisations (Daff, 2021; Edeigba, 2022; Osmani et al., 2017). Accounting functions, such as invoicing, bookkeeping, drafting of financial statements, tax planning, preparing tax returns, tax assessment for individuals, businesses and governmental bodies, have progressed to a sophisticated ICT level (Birt et al., 2017). As a result, employers highly value accountants who demonstrate proficiency in these pertinent skills (Fernandez & Aman, 2018; Yoon, 2020), resulting in challenges for accounting graduates who lack appropriate ICT skills to find employment in the workplace of the Fourth Industrial Revolution (4IR) (Ghani, 2019; O'Shea, 2017; Yoon, 2020). In the field of accounting, ICT and HOT are related as knowledge of ICT techniques and processes can help the accountant to derive and interpret accounting information more accurately; hence, improving rational decision-making and problem-solving attributes (Rkein et al., 2020).

This article reports on a study conducted in the Ghanaian context. In Ghana, accounting students who graduate, struggle to secure employment (Ampadu-Ameyaw et al., 2020; Baah-Boateng, 2018; Institute for Fiscal Studies [IFS], 2019), because many lack the necessary skills and competencies to execute tasks proficiently at the expected standard within the marketplace (Tetteh et al., 2021). Employers are therefore struggling to find accounting graduates with the appropriate knowledge, skills and competencies to fill vacancies (International Finance Corporation [IFC], 2019). Macaulay (2014) and the IFC (2019) state that, in Ghana, 30% of employers encounter difficulties when hiring accounting graduates for technology-driven positions across diverse industries. Owing to this supply-and-demand gap for accounting graduates with ICT and HOT skills, many Ghanaian employers are recruiting internationally, mainly from the developed countries, such as the United States and the United Kingdom (IFC, 2019). In most instances, the employment of expatriate accounting staff increases the operational costs of such companies due to the differences in salary and working conditions that the employers must meet. Many stakeholders, especially parents and policymakers, voiced their concerns about this phenomenon

(Ampadu-Ameyaw et al., 2020; Baah-Boateng, 2018).

Criticism of the employment difficulties encountered by graduates in Ghana often points towards the accounting education system, citing its failure to impart the necessary knowledge and skills required by employers adequately (Ampadu-Ameyaw et al., 2020; Nibelli, 2018). Although prior research highlighted the challenge years ago (Ampadu-Ameyaw et al., 2020; Dadzie et al., 2020; Kwarteng & Mensah, 2022), current accounting education still focusses on imparting technical accounting knowledge (Ackerman, 2019). For this reason, the current research was conducted to explore the roles of various stakeholders in finding ways to solve the accounting graduate skills conundrum.

To date, limited studies have been conducted in Ghana to determine the essential ICT and HOT skills needed by accounting graduates from universities to boost their employability (Kwarteng & Mensah, 2022; Natia & Al-hassan, 2015). The current study, applied a quadruple helix (QH) innovation model (see Carayannis & Campbell, 2009) and Bloom's revised taxonomy (see Anderson et al., 2002) to determine which ICT and HOT skills accounting graduates need, and how QH actors of government, academics, employers, and graduates could collaborate to develop these skills to enhance the graduates' employability. The findings of the current study led to the development of an innovative framework to improve the employability prospects of Ghanaian accounting graduates. The remainder of the article is structured as follows: sections 2 and 3 present the literature review and theoretical framework that underpinned the study, whilst section 4 outlines the research methodology. The results, including the innovative framework, are presented in sections 5 and 6, while section 7 provides the conclusion and recommendations for further research.

2. Literature Review

Prior literature referred to the shortages "in the supply of professional accountants to meet the ever-growing demand" (Bekoe et al., 2018, p. 459). Notwithstanding the expectation that the changing and dynamic business environment will increase this demand for accountants, other authors (see Cohn, 2020; Daff, 2021; Tysiac, 2019) contend that accounting graduates often struggle to secure employment, because they lack the employability skills, especially ICT and HOT skills required by employers.

2.1 Accounting Education in Ghana

Universities in Ghana are the main entities in charge of education and training of accountants (Osei, 2019). At present, accounting education is provided by ten public universities (typically referred to as 'traditional universities'). In addition to the ten traditional universities, Ghana has ten technical universities, and several private institutions accredited to offer accounting degree programmes (Ghana Tertiary Education Commission [GTEC], 2021). Moreover, three prominent independent professional accounting institutions – the Association of Chartered Certified Accountants (ACCA), the Chartered Institute of Management Accountants (CIMA), and the Institute of Chartered Accountants, Ghana (ICAG) – also play a critical role in training accountants in Ghana (Uche, 2007). The majority of universities in Ghana that provide accounting education focus on

areas such as financial accounting, public sector accounting, management accounting, management information systems, taxation, audit and investigation procedures, alongside a range of general education courses. The degree (either BSc or BCom) spans four years, and graduation necessitates accumulating a minimum of 135 credits. Traditional teaching methods dominate the accounting learning process, with instructors heavily utilising textbooks and exercises as the primary educational tools, while limited attention is given to ICT and HOT skills, which accounting graduates need for sustainable employment in the 4IR environment.

2.2 ICT Skills for Accounting Graduates

ICT includes the use of various technical devices, comprising data communication, voice telephony, computers, and related technologies necessary for converting, processing, storing, and transmitting diverse forms of digital information (Niebel et al., 2013). Employers specifically seek accounting graduates with certain ICT skills that are pertinent to the accounting profession. Abedin (2019) investigated the skills employers in Bangladesh require of new accounting graduates, and revealed the necessity of advanced Microsoft Excel application skills and operational knowledge of accounting packages, such as Pastel, QuickBooks, Sage, and cloud computing. Focussing on senior-level managers of public accounting firms in Malaysia, Amirul et al. (2017) found that accounting degree programmes should concentrate on know-how and application skills of accounting software, accounting systems, database concepts and analysis, project management, and business processes. The Malaysian Institute of Accountants (MIA) (2019) identified that professional accountants must stay updated on emerging technologies, such as big data cloud computing, cyber security, mobile money platforms, and social media. An Australian study by Daff (2021) found that most employers require accounting graduates to be competent in the use of Microsoft Excel, Microsoft Word, and accounting applications for them to be successful in the 4IR environment.

In the developing African context, the findings seem to be similar. A study by Tanaka and Sithole (2015) in Swaziland (now Eswatini) found that employers required newly recruited accounting graduates to exhibit suitable technological skills in accounting software, spreadsheet software (such as Microsoft Excel), word processing (such as Microsoft Word), as well as communication and electronic commerce programs to remain relevant. Even though Awayiga et al. (2010) previously identified spreadsheet software, database and word processing packages as the ICT competencies necessary for accounting graduates in Ghana upon entering the accounting profession, challenges in this regard persist.

2.3 HOT Skills for Accounting Graduates

HOT skills include the capacity for critical, creative, analytical, and systematic thinking, along with the ability to formulate fair and constructive judgements (Mrah, 2017). Kageyama et al. (2022) describe HOT skills as including the ability to communicate, collaborate with others, analyse situations, and evaluate scenarios. For Matondang et al. (2019), HOT skills involve an individual's ability to manipulate, connect, and transform pre-existing experiences and knowledge to make decisions and resolve challenges in difficult situations.

Ann Calumpiano (2023) underscores the importance for accountants aspiring to succeed in their chosen profession by possessing not only ICT skills, but also creative problem-solving abilities. Accountants should be able to demonstrate the capacity to resolve issues across various contexts, discern and acknowledge facts, and ideally, foresee challenges while devising pragmatic solutions (Wang, 2020). Organisations need graduate accountants who are creative, can think outside the box, and are able to assist businesses to solve problems and improve their business performance (Abedin, 2019). Supeno et al. (2019) also found that accounting graduates require HOT skills to establish connections between diverse concepts, interpret and resolve problems, make sound decisions, and communicate effectively.

In Bloom's revised taxonomy (see Anderson et al., 2002), remembering, understanding, and applying are categorised as lower-order thinking (LOT) skills, while analysing, evaluating, and creating are referred to as HOT skills. This implies that students ought to retain fundamental concepts and facts as a foundation for learning, motivating them to progress towards the ability to generate innovative work at an advanced level. The current study focusses on the HOT skills of analysing, evaluating, and creating, because accounting graduates should possess the ability to dissect information into its component parts and discern how the individual elements interrelate with each other and contribute to the overall purpose (Zapalska et al., 2018). Prior to arriving at a well-informed decision and comparing, contrasting and prioritising activities, accounting graduates need to evaluate the situation. Once this is in place, the graduate needs to create new ideas through activities, such as designing and inventing (Supeno et al., 2019).

To be successful in an accounting career, employers require accounting graduates to have solid critical thinking, problem-solving, and communication skills (Daff, 2021; Plant et al., 2019). Accounting graduates should therefore have the ability to apply, re-organise, and enhance knowledge in challenging situations. This would enhance their employability and effective workplace performance (Ackerman, 2019; Jeremiah & Daferighe, 2019).

It can be argued that, in the accounting field and in a 4IR environment, contemporary accountants not only need ICT skills for effective and efficient performance in the workplace (Moffitt et al., 2018); they also need to be creative critical thinkers who can tactically present financial information to users (Daff, 2021; Fernandez & Aman, 2018; Rkein et al., 2020). Kwarteng and Mensah (2022), studying the skills sets of Ghanaian accounting graduates, suggest that employers in Ghana continue to emphasise the need for new accounting graduates to possess critical and analytical thinking skills alongside the discipline-specific knowledge and technical skills in order to be adequately prepared for the workforce.

3. Theoretical Framework

The QH model of innovation (see Carayannis & Campbell, 2009) formed the theoretical foundation for the current study. The QH model is based on the triple helix (TH) theoretical model (Etzkowitz & Leydesdorff, 2000). The TH model centres on the interconnected relationship between government, academics, and

employers within the context of the knowledge society. The model adds a fourth helix (implying the public, media, culture-based public, civil society, consumers or users) (see Arnkil et al., 2010; Carayannis & Campbell, 2009; Pascu & Van Lieshout, 2009). The fourth helix signifies that, in a modern knowledge-based society, knowledge extends beyond academia, industry, and government, reaching into every aspect of society and the innovation ecosystem (Cai & Lattu, 2022). In the context of the current research, the fourth helix is referred to as 'graduates', representing individuals (consumers and end-users) in society who have successfully completed an accounting degree, and who are prepared to enter the accounting workplace.

The QH model was selected for this study because it emphasises the dynamic roles played by government, academics, employers and graduates in driving research, advancing knowledge, promoting innovation and evolving societal progress (Cai & Lattu, 2022). Although the QH innovation model has been extensively used in other fields in developed and other developing countries (see Carayannis & Campbell, 2009; Hazmilah et al., 2016; Lindberg et al., 2014), its application in Ghana remains limited, especially in the field of accounting education. The current study therefore contributes to the development of QH theory by introducing an alternative QH framework, which places significant emphasis on the relationships among key QH stakeholders within the academic landscape of Ghana. The QH innovation model (see Figure 1) illustrates the interconnected relationships between government, academics, employers, and graduates, highlighting their collaborative efforts in expediting the advancement of ICT and HOT skills ultimately aimed at improving the employability of accounting graduates. Figure 1 below illustrates the alternative QH framework chosen to guide the current study.

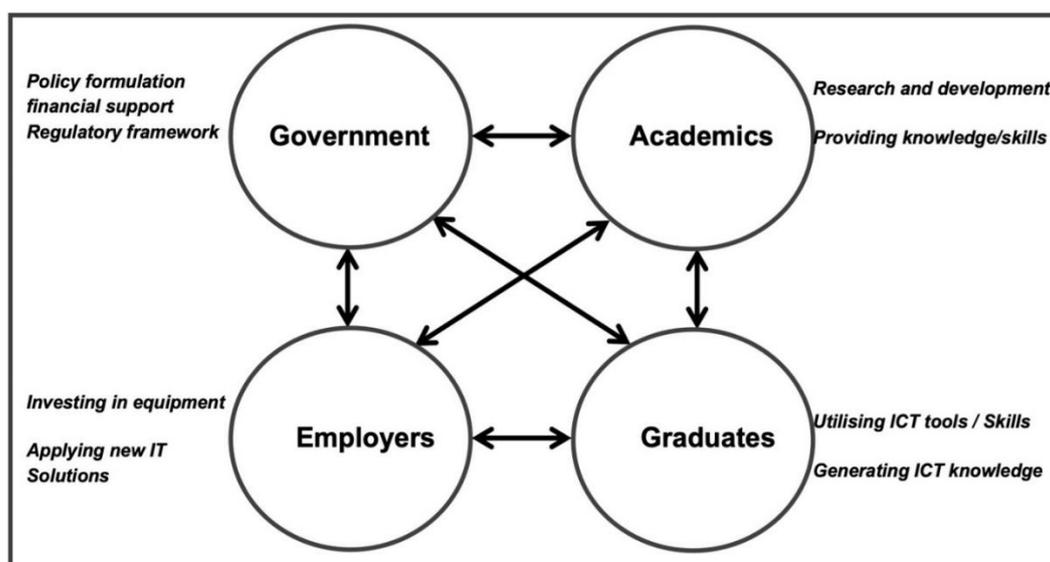


Figure 1: Alternative quadruple helix (QH) framework of knowledge in an academic setting

Source: Authors' own compilation (based on Björk, 2014, p. 187; Lindberg et al., 2014, p. 102).

Government shapes policies to support the efficient operations of businesses, universities, and research institutions. Additionally, it allocates resources for research and development, promotes the creation of new enterprises, and prioritises the welfare of its citizens (Miron & Gherasim, 2018). Through research, academics develop educational programmes focussed on imparting knowledge, skills, and competencies that have the potential to promote the creation of new businesses, especially within the technology sector (Ranga & Etzkowitz, 2013). Employers foresee market needs, seize opportunities, and assess risks associated with implementing new technologies. They also initiate and manage business projects, ultimately creating employment prospects for graduates (Bilbao et al., 2016). Graduates do not just utilise technology; they also contribute to its creation, transitioning the role of the university from being solely a traditional workforce provider to becoming a hub for technology innovation, production, and transfer of knowledge (Hazmilah et al., 2016).

In the current study, Bloom's revised taxonomy (see Anderson et al., 2002) was added to the QH model to explain the HOT skills because the QH model is noted for advancing HOT skills undergraduate students need to enhance their employability after completing the accounting programme (Zapalska et al., 2018). More recently, attention has focussed on the fact that accountants should be able to demonstrate analytical and creative thinking (Mrah, 2017; Wolcott & Sargent, 2021). Zapalska et al. (2018) assert that an effective method for teaching HOT skills among undergraduates can be founded on the conceptual framework of HOT skills, which integrates Bloom's revised taxonomy.

4. Methodology

The current research adopted a qualitative approach to investigate the essential ICT and HOT skills expected of university accounting students upon completing the programme. Additionally, it examined the responsibilities of QH stakeholders in fostering the development of these skills to enhance the graduates' employability. Data was collected through in-depth semi-structured interviews.

Following the QH theory, four distinct groups of 30 respondents (QH stakeholders), comprising **government officials** (three), **accounting academics** (ten), **employers** (seven), and **accounting graduates** (ten) were interviewed. The accounting academics and graduates were selected from five major Ghanaian public universities, and employers included representatives from both public and private sectors. Government officials were chosen from GTEC under the Ministry of Education. A purposive sampling method was utilised to select government officials, accounting academics, and employer participants, whereas snowball sampling was employed to recruit accounting graduates. These sampling methods were implemented to ensure a comprehensive and well-rounded representation of individuals capable of addressing the research questions (Tongco, 2007). To qualify for inclusion in the study, all the participants had to possess at least three years of professional and working experience. The justification for selecting these stakeholders can be summarised as follows:

- *Government officials* have the responsibility of developing policies, funding programmes, and implementing reforms aimed at promoting skills

development and creating employment opportunities.

- *Accounting academics* are integral in producing future accountants while also contributing actively to research and innovation endeavours aimed at addressing challenges within the accounting profession.
- *Employers* have an understanding of the qualifications, ICT and HOT skills required to execute accounting duties effectively within their organisations.
- *Accounting graduates*, either currently employed or seeking employment, are well positioned to articulate their requirements regarding ICT and HOT skills necessary for their careers.

Different interview schedules (Appendix 1), each pilot-tested, were utilised for the four participant groups. Common questions were posed to all interviewees across these groups. This approach aimed to identify both areas of consensus and areas of disparity among the interviewees' responses regarding the main research questions, thereby ensuring collection of credible and dependable data. The interview questions focussed on two key aspects: the ICT and HOT skills required for an accounting career; and the respective roles of government, academics, employers, and graduates in promoting the development of ICT and HOT skills to enhance the employability of accounting graduates. The interviews were conducted with individuals face to face on the dates, at the times and locations convenient for the interviewees. Measures were taken to ensure that the interview questions correlated with the research questions to address these effectively. Challenges arose during the interviews, with some participants cancelling scheduled interviews at the last minute, after the researcher had already travelled a significant distance to the interview venue.

The researchers obtained ethics approval from the Ethics Review Committee of the Faculty of Accounting Sciences of the university where the research was conducted. Individual participants signed consent forms and, where applicable, permissions were obtained from the employers of the research participants. The purpose, approaches, overall importance of the research, as well as the benefits and risks involved in participating in the study were explained to participants, to enable them to provide informed consent (Halej, 2017). With participants' consent, the interview responses were captured using an electronic audio recorder, and afterwards transcribed verbatim. Inductive thematic analysis was employed with the assistance of ATLAS.ti™ 9 to identify, analyse and interpret important themes and categories in the datasets to address the research questions (Clarke & Braun, 2017). The study employed an inductive approach to allow the data to guide the analysis process independently, as explained by Alhojailan (2012). To ensure anonymity and confidentiality, pseudonyms were assigned to the participants in lieu of their actual identities:

- the pseudonyms U1, U2, U3, U4, and U5 represent the five universities;
- academic staff at U1 are, for example, referred to as AS1U1;
- U1 graduates are, for example, referred to as GRAD1U1;

- EMP represents an employer; and
- GOV represents a government official.

5. Results

The six steps of thematic analysis proposed by Braun and Clarke (2006) were employed to analyse the interview data, namely data familiarisation, coding, themes searching, themes review, definition of themes, and writing up of the findings. The analysis of the data produced two themes.

- (1) ICT and HOT skills requirements for accounting career; and
- (2) Roles to promote the development of ICT and HOT skills.

This section presents the findings and discussion of these two themes, related categories, codes, and theories which emanated from the data analysis. Table 1 presents a holistic view of the themes, categories, related codes, and theories.

Table 1: Structure of themes, categories, related codes, and theories

RELATED CODES	CATEGORIES	THEMES	THEORY
Microsoft computer and accounting software packages	Computer application packages skills	ICT and HOT skills requirements for accounting career (refer to section 5.1)	Bloom's revised taxonomy
HOT skills	Soft skills		
Interpersonal skills			
Entrepreneurship and innovative skills			
Policy formulation and regulation	Individual roles of government	Roles to promote development of ICT and HOT skills (refer to section 5.2)	QH innovative model
Accreditation and quality assurance of programmes			
Resources for graduateness and employability or self-employment			
Creation of an enabling environment for doing business			
Conducting research	Individual roles of academics		
Fostering improved graduateness			
Practical exposure of students to 4IR technologies			
Undertaking and disseminating evidence from tracer studies			
Developing industrial practicum	Individual roles of employers		
Fulfilling the role of being employers and supporting the uptake of graduates into the active economy			
Assisting with effective work readiness programmes			
Support through investment and corporate social responsibility (CSR)			

RELATED CODES	CATEGORIES	THEMES	THEORY
Ongoing learning and skills development	Individual roles of accounting graduates		
Volunteerism and networking			
Development of the acumen to be self-starters and entrepreneurs			

The results are explained using relevant direct quotes extracted from the interviews. Please note that all quotes are reproduced verbatim and unedited. These quotes were corroborated with the findings from existing literature relevant to the themes generated, complemented by the researchers' interpretations, and outlined as in the sections below.

5.1 ICT and HOT Skills Requirements for Accounting Career

In response to the first research question, almost all the participants stated that, with the unprecedented pace of technological development, employers expect accounting graduates to acquire several 4IR ICT and HOT skills to be able to survive in the dynamic work environment. Regarding the specific ICT skills, EMP5 stated, *"the graduates must have advanced knowledge in Microsoft office packages, especially Microsoft Excel, PowerPoint and accounting software as well as PowerPoint to present the reports"*. GRAD2U3 said in this regard, *"proficiency in Microsoft Word and internet usage is crucial, especially in situations where producing and delivering documents via email is required"*. EMP4 added, *"[a] new trend is emerging where there is a growing demand for loading, modelling, and visualising data effectively, making skills in Microsoft Power BI increasingly sought after."*

The findings highlight the importance of accounting graduates being proficient in using specialised accounting software, such as QuickBooks, Sage, Accounting Tally, Oracle, ERP, GIFMIS and SAP, alongside expertise in cloud accounting and data analytics.

For the HOT skills, accounting graduates need *"to demonstrate critical thinking, evaluation and thinking outside the box"* (AS1U5). According to GRAD1U3, *"accounting graduates must possess the capacity to understand, assess, and interpret information for effective decision-making"*. An employer participant (EMP1) highlighted the need for graduates to *"demonstrate strong critical thinking abilities, particularly concerning professional scepticism and the capacity for effective questioning"*. As documented in academic literature, the application of HOT skills, such as creative thinking and adept problem-solving, is indispensable for accountants aspiring to achieve success in their chosen profession (Abedin, 2019).

Entrepreneurial and interpersonal skills also emerged as essential competencies for accounting graduates in the contemporary work environment. According to EMP5, *"studying only accounting at the university is insufficient; accounting graduates should complement their accounting expertise with entrepreneurial skills to broaden their professional capabilities"*. One academic (AS1U4) mentioned the necessity for graduates *"to exhibit creativity, entrepreneurial skills, and active involvement in problem-solving, rather than relying solely on being employed by others"*. EMP1 pointed

out, “[c]urrently, the accounting profession emphasises comprehensive understanding of business beyond the core technical expertise”.

Ajayi (2021), Dadzie et al. (2020) and Ruiz-Jiménez et al. (2022) confirm that entrepreneurship plays an important role in reducing unemployment rates and fostering economic growth. Possessing outstanding interpersonal skills will enable graduates to gain trust and admiration within their professional, business and personal relationships (Obakpolo, 2015). In the words of GRAD1U2:

“As an accounting graduate, it is essential to possess soft skills such as taking responsibilities, collaborating effectively with individuals of diverse personalities, developing positive attitudes including emotional intelligence, and demonstrating clear verbal and written communication abilities.”

These perspectives align with findings from prior studies emphasising the rising need for accounting graduates to possess appropriate ICT and HOT skills to adapt swiftly and to excel within the current competitive work environment (Ackerman, 2019; Alshare & Sewailem, 2018; McGunagle & Zizka, 2020). The question that remains is who is responsible to equip students with the relevant ICT and HOT skills, as accentuated by the literature and the interviewees.

5.2 QH stakeholders’ Roles in Promoting the Development of ICT and HOT Skills

This section considers the participants’ perceptions of the roles that government, accounting academics, employers and graduates should play to promote the development of ICT and HOT skills of accounting graduates in Ghana.

5.2.1 Government

The government of Ghana, facilitated by regulatory agencies, develops policies related to tertiary education, ICT and employment. GOV2 said the government, through the Ghana Tertiary Education Commission –

“[M]anages and regulates policies and programmes in the higher education space in Ghana, including accounting education right from the secondary to the university level to conform with the existing national policies and strategic direction of the country”.

GOV2 added that government also ensures that “all degree programmes receive accreditation, serving as a guarantee that these programmes meet established academic standards”. One employer participant (EMP6) expressed the view that “the government ought to enhance the effectiveness of regulatory institutions concerning the training and certification of accountants”. This will require strengthening the systems of regulatory institutions and resourcing them for consistent and efficient monitoring of accounting training institutions. This approach ensures the maintenance of standards without compromise. Consequently, strengthening the systems of regulatory institutions will facilitate the production of high-quality accounting professionals to meet the demands of businesses (Canning & O’Dwyer, 2016; International Federation of Accountants, 2018).

In addition, participants indicated that they expected government to provide the universities with the required resources, such as lecture halls, libraries, ICT equipment, and finance.

“Currently, the universities do not have sufficient IT resources (basically personal computers and software) required for effective teaching and learning of ICT skills. Also, most students do not have their own laptops; they must buy it themselves and it is difficult for some of them” (AS1U4).

As stated by GRAD2U4, *“the primary responsibility for providing resources to public universities lies with government, given that these institutions are owned and managed by the government”*. The same participant (GRAD2U4) also mentioned, *“the universities ought to contribute certain resources they require, particularly in terms of ICT infrastructure. This is because, in addition to government grants, universities retain all internally generated funds”*.

The results indicate limitations of government academic policies and inadequate computer laboratory classes, especially in accounting and business classes that strongly encourage a teacher-centred curriculum. An encouraging theory and practice-based modality is required for recruiting graduates.

5.2.2 Academics

One employer interviewee (EMP6) posited that academics *“conduct research aimed at publication and create modules tailored to equip students with the knowledge, skills and qualities required for successful employment or for establishing their own businesses upon completion of their qualifications”*. Another participant (GOV3) however maintained, *“the development of modules should not solely rely on academic staff”*. AS1U3 stated:

“Collaboration between academia, practitioners and businesses in designing the curriculum is necessary. By involving these stakeholders, the resulting curriculum will be tailored to meet their expectations. Developing the curriculum in isolation risks producing graduates who might not align with industry requirements, leading to potential challenges in their acceptance into the workforce.”

It is clear that, to close the employment gap, accounting academics need to collaborate with appropriate stakeholders, especially employers and government agencies, who mostly make use of the graduates of the universities, to determine the contents of the accounting curriculum to benefit all stakeholders.

Most participants emphasised the need for academics to introduce accounting students actively to 4IR technologies, *“to enable them adapt and embrace emerging technologies arising from the 4IR”* (EMP4). As EMP4 pointed out, *“the 4IR should no longer sound abstract to the graduates”*. Regrettably, certain public universities in Ghana do not teach these technological tools effectively, *“except that they are mentioned to the students”* (AS1U4). The literature review however suggested that accounting is no longer about the pen and paper recording of business transactions, reconciliations, reporting routines and validations (Jeremiah &

Daferighe, 2019), but rather how modern technology is incorporated in financial reporting practices to produce quality information for effective decision-making.

From the literature, it was evident that accounting academics should conduct tracer studies to determine whether graduates are having employment challenges or not, and which reasons account for either of the situations (Nugraheni et al., 2020). Tracer studies will provide valuable information about the job-specific skills and employability of accounting graduates from universities, which can serve as a basis for reviewing the accounting curriculum to ensure that graduates receive adequate training for the employment market. The interview data indicated that none of the universities involved had a structured method for actively tracing and engaging with former students to gather feedback regarding their whereabouts, current employment, and overall progress. One academic staff member confessed:

“I am not aware of any existing system to track the progress of the students once they graduate from the school. Therefore, I believe this is an aspect we should consider” (AS2U2).

Another expectation from the participants was for universities to promote industrial attachment or placement programmes that are *“more effective in fulfilling their intended objectives”* (EMP4). This is because *“the current programmes’ duration spans only two to three months, which is significantly inadequate for its intended purpose”* (EMP5), the industrial attachment is *“not well supervised and scored”* (EMP2), and *“certain organisations, particularly those in the public sector, fail to provide students with meaningful exposure to their operations; often, students are relegated to running errands”* (AS1U1). This observation is consistent with the results of the study conducted in Poland by Januszewski and Grzeszczak (2021), namely that accounting and finance students undergoing internships were not tasked with significant accounting responsibilities. Instead, they only observed how these tasks were executed by the accounting staff. It is essential to ensure that industrial attachment programmes are meticulously organised, closely supervised, and integrated into the final assessment of students. This approach will enhance students’ focus, enabling them to acquire essential experience effectively from their internships. Furthermore, *“universities should actively collaborate with employers and government agencies to encourage these entities to take on greater responsibility for students throughout their internship”* (AS1U3). It appeared however that scholars are not usually active in conducting research or attending seminars and make recommendations based on their findings to guide policy formulation and implementation by government and academic policymakers.

5.2.3 Employers

A prevalent viewpoint among the interviewees was that employers should actively contribute to efficient work-readiness programmes, such as internships. Additionally, they should support universities, students and/or graduates through investments or CSR. Although universities employ some graduates, the interviewees emphasised that industries and other institutions are mainly responsible for offering employment opportunities to graduates (AS1U1; AS2U5). The perspectives of the participants align with existing literature suggesting that

employers can use advancements in knowledge to innovate new products and services to satisfy public needs, which would ultimately create employment prospects for graduates (Bilbao et al., 2016). By this, employers would effectively fulfil their responsibility of generating employment, fostering economic growth, and assisting graduates to contribute actively to the economy.

The current study highlighted the importance of employers to offer students and new graduates opportunities through internships to attain the skills and hands-on work experience necessary for the employment market. This is because *“employers often require a minimum of five or more years of relevant work experience for available positions, which most graduates lack”* (GRAD1U5). During internships, students will be able to *“get the practical aspect of what they are being taught in the universities”* (EMP4), and eventually, *“acquire the needed skills and experience for the end-user industry”* (EMP2). AS2U2 argued:

“[O]ur role is to educate and train the minds of our students by imparting essential knowledge. Subsequently, it becomes the industry’s responsibility to offer opportunities for students to acquire the necessary skills and practical work experience demanded by the employment market.”

Another academic staff participant, AS1U5, maintained, *“universities cannot singularly prepare accounting graduates to perfectly fit the needs of every organisation; achieving this goal is highly impractical”*.

According to Caiyod et al. (2015), obtaining a university degree alone does not ensure readiness for the workforce. Employers should therefore not only be ready to offer students opportunities to gain skills and practical work experience during their university years but should also be prepared to employ new graduates and provide on-the-job training to hone graduates’ skills for effective performance in their assigned roles.

The Ghana Education Strategic Plan highlighted that approximately 55% of the total funding for public tertiary institutions in Ghana is provided by government. A substantial portion is allocated to staff salaries (Ministry of Education [MoE], 2018). Accordingly, EMP7 stated, *“the responsibility for funding education should not solely lie with the government; businesses also have a role in investing in education to develop the skilled workforce that meets our needs”*. Participants saw the need for industries to support the universities specifically in the following areas:

- supplying infrastructure, such as libraries, lecture halls, and ICT laboratories to support universities to increase their capacity to train more graduates for the labour market (GOV1; GRAD2U4).
- creating training and development centres aimed at equipping new graduates with practical skill sets across diverse specialisations, thereby enhancing their employability or empowering them to establish their own businesses (AS1U1; GRAD2U2);
- funding academic research endeavours aimed at identifying the specific skill sets and competencies that employers seek in accounting graduates

(AS1U3; EMP5); and

- instituting scholarship schemes for needy but talented graduates to pursue advanced studies or training within their organisations or other organisations (GRAD1U2; GRAD2U3).

These responses highlight how the business sector, by means of CSR and investments, could play a role in advancing accounting education, particularly at university level. Such investments would not only improve students' academic performance and the overall quality of education but also support the development of high-calibre accounting graduates for diverse industries.

5.2.4 Graduates

The current study identified four main areas where graduates need to develop their ICT and HOT skills and enhance their employability, namely ongoing learning and skills development, voluntarism, networking, and developing the acumen to be self-starters and entrepreneurs. One important thing that accounting graduates can do to secure employment and remain relevant in the workplace is *"to add value to themselves through continuous training and upgrading their knowledge"* (GRAD2U5). *"Graduates should progress beyond their university-acquired knowledge and skills and embrace continuous learning due to rapid advancements in technology and the dynamic landscape of the accounting profession, with evolving tasks"* (EMP1). AS2U1 suggested that graduates *"can add professional certificates to their academic qualifications"*. As revealed by both the interview results and literature, there is a strong preference among accounting employers for candidates equipped with a blend of academic and professional qualifications over those possessing academic credentials only (Abdulrahamon et al., 2018). This is because *"degree programmes emphasise conceptual understanding, whereas professional training aims to equip graduates with practical skills tailored for the industry"* (EMP7). Having both professional and academic qualifications equips graduates with a competitive edge in the employment market. Upon employment, this skill set not only strengthens their ability to support organisations but also contributes significantly to advancing the accounting profession.

Accounting graduates who are currently unemployed should engage in voluntary work and networking activities to bolster their employability. *"Volunteerism offers unemployed graduates an avenue to gain practical experience to enhance their skills, thereby creating added value for their personal and professional development"* (GRAD2U1). A recent study indicates that approximately 80% of job openings are filled through networking (Fisher, 2019). By actively participating in networking and collaborations, unemployed accounting graduates could gain valuable insight into job opportunities and quickly utilise these connections to secure employment.

Many interviewees advised accounting graduates to think beyond seeking employment from government or companies only and *"[to] leverage the knowledge and skills gained to take calculated risks, innovate, and generate employment opportunities for both themselves and others"* (GOV2). This is because *"the country's economy is not expanding well enough to provide employment opportunities for all"*

graduates" (AS1U5). According to AS1U4:

"[W]e require many more of the graduates to exhibit creativity, become entrepreneurs, and actively contribute to solving problems instead of relying on others to take these initiatives on their behalf."

Dadzie et al. (2020) however argue that young entrepreneurs encounter challenges, such as current weak support systems for promoting entrepreneurship and the growth of small-scale businesses for self-employment. Consequently, *"practical schemes such as provision of financial support, writing viable business proposals, managing budgets and how to physically register a company should be established to support graduates who want to venture into entrepreneurship"* (GRAD1U3).

As established by various studies (Ajayi, 2021; Dadzie et al., 2020), entrepreneurship plays a role in mitigating unemployment and promoting economic growth. The current research findings however indicate that, to thrive in entrepreneurship endeavours, accounting and other graduates require additional training, financial assistance, and mentorship (AS2U4; EMP5; GRAD1U5). Consequently, it becomes necessary for government, financial institutions, and other stakeholders to establish frameworks to assist start-ups in accessing resources essential for the creation and expansion of businesses, thereby contributing to employment opportunities.

6. Twenty-First Century Skills Framework

The proposed ICT and HOT skills development framework is based on the QH innovation model and on the revised Bloom's taxonomy. The framework (see Figure 2) outlines the network and collaborative dynamics among the four innovation stakeholders – government, academics, employers, and graduates – for promoting the development of twenty-first-century skills aimed at improving the employability of accounting graduates.

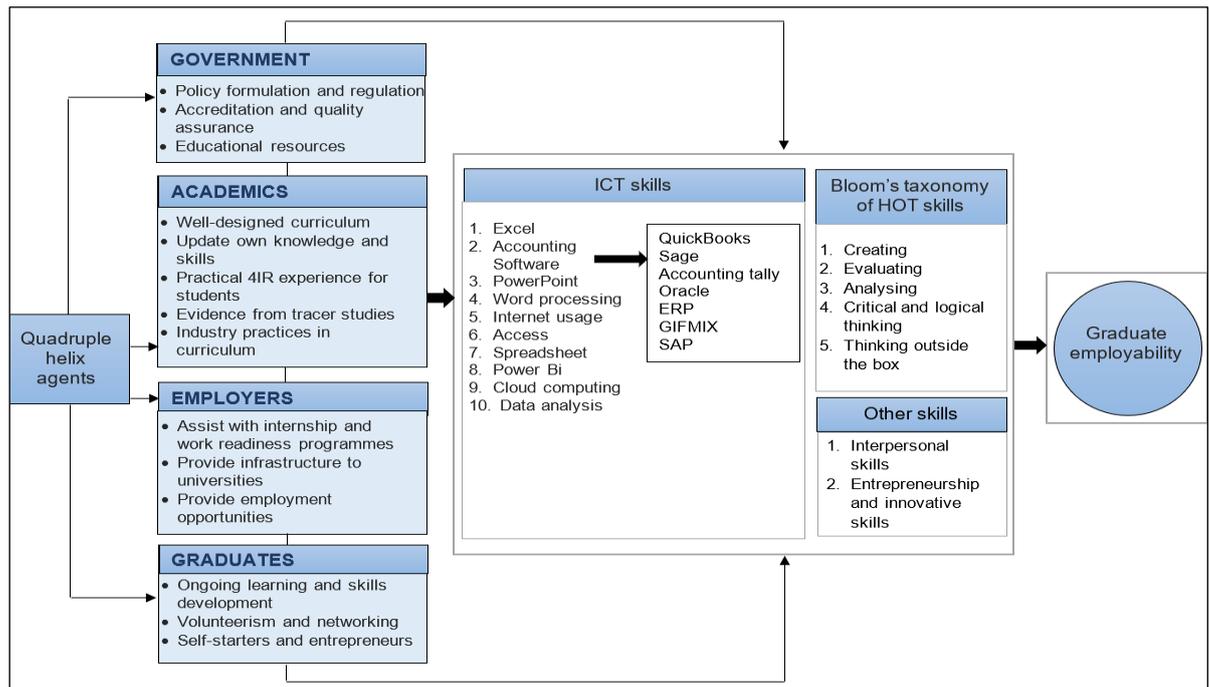


Figure 2. Framework for the development of skills for accounting graduates

Source: Own compilation

In Figure 2, the bi-directional connecting arrows symbolise the collaborative working relationships among the four QH innovative stakeholders: government, academics, employers and graduates. These arrows also highlight the stakeholders' respective roles in advancing ICT, HOT and other skills to improve the employability of accounting graduates from Ghanaian universities. The profound one-way arrow extending from the 'academics' box to the 'skills' box underscores the fundamental role that academics play in providing graduates with the skills essential for employment, as outlined in the accounting curriculum.

While academics play a significant role, the overall approach of the current study within the QH framework was to involve all other stakeholders to contribute actively to the process. This will require government to support academics with the appropriate policies and regulatory frameworks, and both the government and employers need to support academics with funds and other resources. Employers also need favourable government policies and regulations for their business to employ more graduates. Academics need collaboration with employers, government agencies, and graduates to determine the contents of the accounting curriculum. Achieving this necessitates a comprehensive understanding of each stakeholder's role within the QH model. It is crucial to highlight that, while graduate employability is the result of the QH collaboration, for accounting graduates, the outcome will manifest as a profile ideally suited for employment or entrepreneurship. This, in turn, will elevate the quality of life of the graduates, and contribute to national prosperity, as emphasised by Schütz et al. (2019) and Hasche et al. (2020).

From the literature, it was evident that the ICT and HOT skills of accounting graduates have been lacking internationally for many years (see Cohn, 2020; Daff, 2021; Tysiac, 2019). Not enough is done to solve the problem. This is also evident in Ghana where employers are starting to employ ICT graduates to perform accounting-related jobs. The interviews with the key stakeholders were an attempt to find a solution to the challenges. The research findings indicate that accounting graduates need to be proficient in using accounting software, alongside proficiency in critical thinking, problem solving, and communication skills. The current research however also revealed a growing demand for proficiency in cloud computing, data analytics, as well as Excel and Power BI because of the effect of advanced technology on the accounting environment. Additionally, accounting graduates should demonstrate creativity, analytical skills for innovative decision-making, and an entrepreneurial spirit, alongside strong interpersonal skills. Furthermore, contrary to the findings of previous studies (such as Kwarteng & Mensah, 2022 and Tufuor & Servoh, 2022) that universities bear the exclusive responsibility of providing accounting graduates with the requisite skills for employment, the current study revealed that a combined effort between the universities and other stakeholders is critical to attain this goal effectively. Universities should involve government and other stakeholders in revising their curricula to deliver the requisite competencies graduates need for employment.

7. Conclusion

While this article delved into ICT and HOT skills concerning university accounting graduates in Ghana and their challenges in meeting employers' skill requirements, the findings are applicable to other countries as well. Following a qualitative research approach, the current study revealed the interactive roles of government, academics, employers, and graduates to ensure that the current generation of accounting graduates will be able to acquire and demonstrate relevant ICT and HOT skills. Through regulatory agencies, governments should formulate policies concerning ICT and youth employment, provide accreditation of academic programmes, and ensure the quality of accounting programmes. Governments should also allocate resources strategically to enhance graduateness outcomes, and support employability or self-employment initiatives. Academics need to conduct research aimed at creating modules to equip students with the knowledge, skills, and qualities required for successful employment or for establishing their own businesses upon completion of their qualifications; foster graduateness and expose students in a practical way to 4IR technologies; conduct and share findings from tracer studies; and establish industrial practicum opportunities. Employers are required to contribute to effective work readiness programmes, such as internships, and provide support to universities, students, or graduates through investment or corporate social responsibility initiatives. Graduates need to engage in continuous learning and skills development, participate in voluntary activities, establish networks, and develop the mind-set to become self-starters and entrepreneurs. Graduates can achieve successful life-long learning by engaging in professional development courses, advanced degree programmes, job-training classes, or self-study. Embracing a continuous learning mind-set does not only enhance skills, but also provides added advantages in the ever-evolving job market.

The current study utilised a qualitative research methodology that primarily relied on the perceptions of the participants. Future research might aim to validate the identified skills further by employing quantitative or mixed-method research methodologies to facilitate quantifiable comparisons. While the study extensively covered the ICT and HOT skills essential for accounting graduates, there is potential for future research using a QH approach to explore these skills among graduates in different fields. Further research could include the involvement and contributions of professional accounting bodies within the context of a quintuple helix framework.

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Competing interests

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

8. References

- Abdulrahamon, A., Adeleye, S. T., & Adeola, F. (2018). Impact of educational, professional qualification and years of experience on accountant job performance. *Journal of Accounting and Financial Management*, 4(1), 32–44.
- Abedin, R. (2019). Employers' expectation towards global certified accountants and financial management graduates: A study on focal spot. *International Journal on Governmental Financial Management*, 19(1), 59–74.
- Ackerman, J. (2019, October 22). The accounting curriculum needs a complete overhaul. *The CPA Journal*. <https://www.cpajournal.com/2019/10/22/the-accounting-curriculum-needs-a-complete-overhaul/>
- Ajayi, O. B. (2021). Teachers' perceptions of the role of entrepreneurship education in the career choice decision-making of business studies learners in Gauteng South Africa. *International Journal of Learning, Teaching and Educational Research*, 20(6), 244–257.
- Alhojailan, M. I. (2012). Thematic analysis: a critical review of its process and evaluation. *West East Journal of Social Sciences*, 1(1):39–47.
- Alshare, K., & Sewailem, M. F. (2018). A gap analysis of business students' skills in the twenty-first century: A case study of Qatar. *Academy of Educational Leadership Journal*, 22(1), 1–22.
- Amirul, S. M., Mail, R., Abu Bakar, M. A., & Ripain, N. (2017). Information technology knowledge and skills for accounting graduates: An insight from public accounting firms. *Indian Journal of Science and Technology*, 10(12), 1–6.
- Ampadu-Ameyaw, R., Jumpah, E. T., Owusu-Arthur, J., Boadu, P., & Fatunbi, O. A. (2020). A review of youth employment initiatives in Ghana: Policy perspective. *FARA Research Report*, 5(5), 1–41.
- Anderson, L. W., Krathwohl, D. R., & Bloom, B. S. (2002). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. *Theory into Practice*, 41(4), 212–218.
- Ann Calumpiano, D. C. (2023). Employability skills and performance of accounting graduates in the workplace. *Russian Law Journal*, 11(6), 201–207.
- Arnkil, R., Järvensivu, A., Koski, P., & Piirainen, T. (2010). *Exploring the quadruple helix: Report of quadruple helix research for the CLIQ project.*

- http://files.kotisivukone.com/testataan.kotisivukone.com/julkaisut/exploring_quadruple_helix-2010-1.pdf
- Association of International Certified Professional Accountants. (2022). *2021 trends: A report on accounting education, the CPA exam, and public accounting firms' hiring of recent graduates*. https://www.micpa.org/docs/site/educator-assets/2021-trends-report.pdf?sforsn=bfb9c261_2
- Awayiga, J. Y., Onumah, J. M., & Tsamenyi, M. (2010). Knowledge and skills development of accounting graduates: The perceptions of graduates and employers in Ghana. *Accounting Education: An International Journal*, 19(1), 139–158.
- Baah-Boateng, W. (2018). *The youth unemployment and joblessness challenge in Ghana: Revisiting the issues*. African Centre for Economic Transformation.
- Bekoe, R. A., Owusu, G. M. Y., Ofori, C. G., Essel-Anderson, A., & Welbeck, E. E. (2018). Attitudes towards accounting and intention to major in accounting: A logistic regression analysis. *Journal of Accounting in Emerging Economies*, 8(4), 459–475. <https://doi.org/10.1108/JAEE-01-2018-0006>
- Bilbao, B., Vankalck, S., Deiss, R., Saiz, R., & Cravetto, R. (2016). *Science, research and innovation performance of the EU: A contribution to the open innovation, open science, open to the world agenda* European Commissioner for Research, Science and Innovation.
- Birt, J., Wells, P., Kavanagh, M., Robb, A., & Bir, P. (2017). *ICT literature review: Agenda item 4-2*. International Accounting Education Standards Board.
- Björk, P. (2014). The DNA of tourism service innovation: A quadruple helix approach. *Journal of the Knowledge Economy*, 5(1), 181–202. <https://doi.org/10.1007/s13132-014-0183-x>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. doi.org/10.1191/1478088706qp063oa
- Cai, Y., & Lattu, A. (2022). Triple helix or quadruple helix: Which model of innovation to choose for empirical studies? *Minerva*, 60(2), 257–280.
- Caiyod, K. D., Escamillas, B. C. B., Guarina, K. L. C., & Gesmundo, J. (2015). Factors associated to fresh graduates' employability in the hospitality industry. *PU-Laguna Journal of International Tourism and Hospitality Management*, 3(1), 49–70.
- Canning, M., & O'Dwyer, B. (2016). Institutional work and regulatory change in the accounting profession. *Accounting, Organizations and Society*, 54(1), 1–21.
- Carayannis, E. G., & Campbell, D. F. J. (2009). 'Mode 3' and 'quadruple helix': Towards a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3/4), 201–234.
- Clarke, V., & Braun, V. (2017). Thematic analysis. *Journal of Positive Psychology*, 12(3), 297–298. <https://doi.org/10.1080/17439760.2016.1262613>
- Cohn, M. (2020, August 26). Hiring of accounting graduates by CPA firms declines 30%. *Accounting Today*. <https://www.accountingtoday.com/news/hiring-of-accounting-grads-by-cpa-firms-declines-30>
- Dadzie, C. E., Fumey, M., & Namara, S. (2020). *Youth employment programmes in Ghana: Options for effective policy making and implementation*. International Development in Focus Series. World Bank Group. <https://doi.org/10.1596/978-1-4648-1579-9>
- Daff, L. (2021). Employers' perspectives of accounting graduates and their world of work: Software use and ICT competencies. *Accounting Education*, 30(5), 495–524. <https://doi.org/10.1080/09639284.2021.1935282>
- Dawkins, M. C., & Dugan, M. T. (2022). An update on the future of accounting education: A pessimistic outlook calls for major changes. *CPA Journal*, 92(9/10), 20–25.
- Edeigba, J. (2022). Employers' expectations of accounting skills from vocational education providers: The expectation gap between employers and ITPs. *International Journal of Management Education*, 20(3), 1–13. <https://doi.org/10.1016/j.ijme.2022.100674>

- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and "Mode 2" to a triple helix of university-industry-government relations. *Research Policy*, 29(2), 109-123.
- Fernandez, D., & Aman, A. (2018). Impacts of robotic process automation on global accounting services. *Asian Journal of Accounting and Governance*, 9, 123-132. <https://doi.org/10.17576/ajag-2018-09-11>
- Fisher, J. F. (2019, December 27). *How to get a job often comes down to one elite personal asset*. CNBC. <https://www.cnbc.com/2019/12/27/how-to-get-a-job-often-comes-down-to-one-elite-personal-asset.html>
- Ghana Tertiary Education Commission. (2021). *List of accredited tertiary education institutions as at 31 March 2021*. Author.
- Ghani, E. K. (2019). Industry 4.0: Employers' expectations of accounting graduates and its implications on teaching and learning practices. *International Journal of Education and Practice*, 7(1), 19-29. <https://doi.org/10.18488/journal.61.2019.71.19.29>
- Halej, J. (2017). *Ethics in primary research (focus groups, interviews and surveys)* [Research and Data Briefing]. ECU.
- Hasche, N., Höglund, L., & Linton, G. (2020). Quadruple helix as a network of relationships: Creating value within a Swedish regional innovation system. *Journal of Small Business & Entrepreneurship*, 32(6), 523-544.
- Hazmilah, H., Zanariah, J., Norida, A., Noraini, S., & Hanipah, H. (2016). Analysing employability competency: Impact of quadruple helix model to prospective graduates. *PEOPLE: International Journal of Social Sciences*, 2(1), 665-684.
- Institute for Fiscal Studies. (2019). *Strong economic growth and significant reduction in employment: The critical issues to address in Ghana's 2019 budget* [Occasional Paper No. 17]. Author.
- International Federation of Accountants. (2018). *Framework for international accounting education & introduction to the international education standards: Agenda item 3-2*. <https://www.ifac.org/system/files/meetings/files/4239.pdf>
- International Finance Corporation. (2019). *Digital skills in sub-Saharan Africa: Spotlight on Ghana*. Author.
- Januszewski, A., & Grzeszczak, M. (2021). Internship of accounting students in the form of e-learning: Insights from Poland. *Education Sciences*, 11, 1-18. <https://doi.org/10.3390/educsci11080447>
- Jeremiah, O. O., & Daferighe, E. E. (2019). The evolving dimensions of the accounting profession and the 21st century expectations. *Archives of Business Research*, 7(5), 226-232. <https://doi.org/10.14738/abr.75.6553>
- Kageyama, Y., Zubieta, S., & Barton, M. (2022). Incorporation of simulation features to improve higher order thinking skills. *The International Journal of Management Education*, 20(1), 1-19. <https://doi.org/10.1016/j.ijme.2022.100628>
- Kwarteng, J. T., & Mensah, E. K. (2022). Employability of accounting graduates: Analysis of skills sets. *Heliyon* 8, 1-9. <https://doi.org/10.1016/j.heliyon.2022.e09937>
- Lindberg, M., Lindgren, M., & Packendorff, J. (2014). Quadruple helix as a way to bridge the gender gap in entrepreneurship: The case of an innovation system project in the Baltic Sea region. *Journal of the Knowledge Economy*, 5(1), 94-113.
- Macaulay, F. (2014). *Technology skills training critical to employ low-income youth*. Making Cents International. https://youtheconomicopportunities.org/sites/default/files/uploads/resource/MakingCentsInternational_TechnologySkillsTrainingLandscape_2014.pdf
- Malaysian Institute of Accountants. (2019). *Digital technology: Preparing the Malaysian accountancy profession*. https://www.mia.org.my/v2/.../07/.../MIA_Technology_Blueprint_Spreads_format.pdf%0A

- Matondang, C. E. H., Hadi, W., & Lubis, M. (2019). The understanding ability of exercises of higher order thinking skill-based anecdote text in 10th grade students of Senior High School 1 Tanjung Tiram. *Budapest International Research and Critics in Linguistics and Education Journal*, 2(3), 118–130. <https://doi.org/10.33258/birle.v2i3.357>
- McGunagle, D., & Zizka, L. (2020). Employability skills for twenty-first century STEM students: The employers' perspective. *Higher Education, Skills and Work-Based Learning*, 4(16), 1–22. <https://doi.org/10.1108/HESWBL-10-2019-0148>
- Ministry of Education. (2018). *Education strategic plan 2018–2030*. Author.
- Miron, D., & Gherasim, I. A. (2018). Linking the triple helix (university-industry-government) to the quadruple helix of university-industry-government-civil society in the field of international business and economics. In *Proceedings of the 12th International Conference on Business Excellence 2018* (pp. 612–625). De Gruyter Open.
- Moffitt, K. C., Rozario, A. M., & Vasarhelyi, M. (2018). Robotic process automation for auditing. *Journal of Emerging Technologies in Accounting*, 15(1), 1–10. <https://doi.org/10.2308/jeta-10589>
- Mooney, B. (2020, March 13). ICT and business skills in high demand. *Irish Times*. <https://www.irishtimes.com/news/education/ict-and-business-skills-in-high-demand-1.3401958>
- Mrah, I. (2017). Developing higher order thinking skills: Towards a rethinking of EFL coursebooks in Moroccan high schools. *Journal of English Language Teaching and Linguistics*, 2(3), 225–243. <https://doi.org/10.21462/jeltl.v2i3.79>
- Natia, J. A., & Al-hassan, S. (2015). Promoting teaching and learning in Ghanaian basic schools through ICT. *International Journal of Education and Development Using Information and Communication Technology*, 11(2), 113–125.
- Nibelli, C. K. (2018, October 7). Our system of education as one of the major causes of unemployment in Ghana. *Modern Ghana*. <https://www.modernghana.com/news/888428/our-system-of-education-as-one-of-the-major-causes.html>
- Niebel, D., Kopp, G., & Beerfeltz, H. (2013). *Information and communications technology: Key technologies for sustainable development* [BMZ Strategy Paper 2/2013e]. Federal Ministry for Economic Cooperation and Development.
- Nugraheni, Y., Susilawati, S., Sudrajat, S., & Apriandi, A. (2020). Tracer study analysis of vocational education in Politeknik Negeri Bandung with exit cohort as an approach. In *Proceedings of the First International Conference on Applied Science and Technology (ICAST 2018)* (pp. 110–115). Atlantis Press.
- Obakpolo, P. (2015). Improving interpersonal relationship in workplaces. *IOSR Journal of Research & Method in Education*, 5(6), 115–125. <https://doi.org/10.9790/7388-0562115125>
- Osei, F. J. (2019). *Sustainability accounting education: An assessment of accounting education in Ghana* [Unpublished MPhil thesis]. University of Ghana.
- O'Shea, S. C. (2017). Characteristics and skills necessary in accountancy. *International Journal of Business and Management*, 13(1), 22–32. <https://doi.org/10.5539/ijbm.v13n1p22>
- Osmani, M. W., Hindi, N., Al-Esmail, R., & Weerakkody, V. (2017). Examining graduate skills in accounting and finance: The perception of Middle Eastern students. *Industry and Higher Education*, 31(5), 318–327. <https://doi.org/10.1177/0950422217721759>
- Pascu, C., & Van Lieshout, M. (2009). User-led, citizen innovation at the interface of services. *Info*, 11(6), 82–96. <https://doi.org/10.1108/14636690910996731>
- Plant, K., Barac, K., & Sarens, G. (2019). Preparing work-ready graduates: Skills development lessons learnt from internal audit practice. *Journal of Accounting*

- Education*, 48, 33–47. <https://doi.org/10.1016/j.jaccedu.2019.06.001>
- Ranga, M., & Etzkowitz, H. (2013). Triple helix systems: An analytical framework for innovation policy and practice in the knowledge society. *Industry and Higher Education*, 27(4), 237–262. doi.org/10.5367/ihe.2013.0165
- Rkein, H., Issa, Z. A., Awada, F. J., & Hejase, H. J. (2020). Does automation of the accounting profession affect employability? Exploratory research from Lebanon. *Open Journal of Business and Management*, 8(1), 175–193.
- Ruiz-Jiménez, M. C., Martínez-Jiménez, R., Licerán-Gutiérrez, A., & García-Martí, E. (2022). Students' attitude: Key to understanding the improvement of their academic results in a flipped classroom environment. *International Journal of Management Education*, 20(2), 1–11. <https://doi.org/10.1016/j.ijme.2022.100635>
- Schütz, F., Heidingsfelder, M. L., & Schraudner, M. (2019). Co-shaping the future in quadruple helix innovation systems: Uncovering public preferences toward participatory research and innovation. *The Journal of Design, Economics, and Innovation*, 5(2), 128–146.
- Supeno, S., Astutik, S., Bektiarso, S., Lesmono, A. D., & Nuraini, L. (2019). What can students show about higher order thinking skills in physics learning? *IOP Conference Series: Earth and Environmental Science*, 243, 1–10. <https://doi.org/10.1088/1755-1315/243/1/012127>
- Tanaka, S., & Sithole, M. (2015). Information technology knowledge and skills accounting graduates need economics and finance. *International Journal of Business and Social Science*, 6(8), 47–52.
- Tetteh, L. A., Agyenim-Boateng, C., Simpson, S. N. Y., & Susuawu, D. (2021). Public sector financial management reforms in Ghana: Insights from institutional theory. *Journal of Accounting in Emerging Economies*, 11(5), 691–713. <https://doi.org/10.1108/JAEE-06-2020-0134>
- Tongco, M. D. C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany Research and Applications*, 5, 147–158. <https://doi.org/10.17348/era.5.0.147-158>
- Tufuor, K. J., & Servoh, M. (2022). Connection between accounting graduates' competences and job performance: Mediating role of continuing professional development. *Cogent Business & Management*, 9(1), 1–15.
- Tysiac, K. (2019). Report finds shift in accounting firm hiring. *Journal of Accountancy*, (8), 1–2.
- Uche, C. U. (2007). *The accounting profession in British West Africa*. The Institute of Chartered Accountants of Scotland.
- Wang, Y. (2020). The uses of critical thinking in accounting and how it improves accounting students' professional skills. In *3rd International Conference on Education Technology and Social Science* (pp. 156–161). Cambridge Scholars Publishing.
- Wolcott, S. K., & Sargent, M. J. (2021). Critical thinking in accounting education: Status and call to action. *Journal of Accounting Education*, 56, 1–19. <https://doi.org/10.1016/j.jaccedu.2021.100731>
- Yoon, S. (2020). A study on the transformation of accounting based on new technologies: Evidence from Korea. *Journal of Sustainability*, 12, 1–22. <https://doi.org/10.3390/su12208669>
- Zapalska, A. M., Nowduri, S., Imbriale, P., & Wroblewski, B. (2018). A framework for critical thinking skills development across business curriculum using the 21st century Bloom's taxonomy. *Interdisciplinary Education and Psychology*, 2(1), 1–14.

APPENDIX 1: Semi-Structured Interview Questions

Interview Protocol: Semi-Structured Interviews:

Title: Striving for innovation: A quadruple helix intervention for accounting education in Ghana

This research is mainly about Information and Communications Technology (ICT) and Higher Order Thinking (HOT) skills. ICT refers to all technical equipment such as data communication, voice telephony, computer and similar fields of technology required for converting, processing, saving and transferring different types of digital information. HOT skills involve not only the ability to think, recall, restate, or recite, but also the ability to connect different concepts, interpret, reason, solve problems, communicate and make the right decisions.

Date of interview:	
Time of interview:	
Place of interview:	
Interviewer:	
Interviewee:	
Highest education qualification of interviewee:	
Position of interviewee:	
Number of years teaching in this department:	
Proposed questions to Accounting Academics (35 minutes – 40 minutes)	
1. Do you think accounting graduates currently face employment challenges in Ghana? If yes, in what ways? If no, why not?	
2. What ICT and HOT skills do you think your accounting students should possess upon the completion of the accounting programme to enhance their employability?	
3. How would you describe your role in equipping future accounting graduates with required employability skills?	
4. What do you know about the university's policy measures with regards to the integration of employability skills, specifically ICT and HOT skills within the accounting curriculum? Any suggestions with regards to future policy initiatives?	
5. Does your university have the infrastructure required to effectively teach the ICT skills the students required for employment?	
6. What do you know about the Fourth Industrial Revolution (4IR) and how will it affect the nature and scope of the accountants' work in practice?	
7. In your opinion are the ICT and HOT skills in the accounting curriculum of your university adequate to enhance the employability of accounting graduates?	
8. Do you see the need to make changes to your accounting curriculum to include new ICT and HOT skills in the future? If yes, in what ways? If no, why not?	
9. What do you think is the best way to equip accounting students with a broad range of ICT and HOT skills that will prepare them for employment?	
10. Do you think collaborations with accounting academics, government, employers and accounting graduates are required to promote the development of ICT and HOT skills to enhance the employability of accounting graduates in the wake of the 4IR? If yes, in what ways? If no, why not?	
11. Other questions/notes	
Proposed Questions to Accounting Graduates (35-40 minutes)	
1. From which university did you obtain your degree? In what year?	
2. Did you encounter employment challenges as an accounting graduate? If yes, in what ways? If no, why not?	

3. What method (manual or computer) does your organization use to record and process accounting information?
4. What ICT and HOT skills do you think accounting students should possess upon the completion of their accounting programme to enhance their employability and performance of at the workplace?
5. Describe how the ICT and HOT skills acquired from your university are enhancing your performance of the accounting task.
6. Are there ICT and HOT skills you perceived to be relevant for the performance of an accounting position, but were not covered in the accounting degree programme of your university?
7. Did you receive any ICT-related job training sponsored by your employer just after being appointed?
8. Please provide an example of how you have handled a critical decision while your supervisor is unavailable.
9. Are the ICT and HOT skills in the accounting curriculum of your university adequate to enhance the employability of accounting graduates in the wake of the Fourth Industrial Revolution (4IR)?
10. Does your university have the infrastructure required to effectively teach the ICT skills the graduates require for employment?
11. Do you see the need to make changes to the accounting curricula of universities to include more relevant ICT and HOT skills in the future? If yes, in what ways? If no, why not?
12. What in your opinion should the following stakeholders, individually or collaboratively, do to enhance the employability of accounting graduates: (I)Universities; (II) Industries (Employers); and (III)Government
13. What role do you think accounting graduates have to play to enhance their employability?

Proposed Questions to Employers (35 minutes - 40 minutes)
1. What is the specialisation field of your organisation?
2. What qualifications do you consider when recruiting accounting graduates for your organisation?
3. What challenges do you encounter in recruiting accounting graduates for your organisation?
4. What method (manual or computer) does your organisation use to record and process accounting information?
5. What skills, specifically Information communication and technology (ICT) and higher order thinking (HOT) skills do you consider relevant for the performance of accounting tasks in your organisation?
6. What do you know about the Fourth Industrial Revolution (4IR) and how it will affect the nature and scope of the accountants' work in your organisation?
7. Do you think the accounting graduates you employ are well equipped for the performance of the accounting tasks from day one in the wake of the Fourth Industrial Revolution (4IR)? If yes, in what ways? If no, why not?
8. Are newly employed accounting graduates able to handle critical decisions while their supervisor is unavailable? If yes, in what ways? If no, why not?
9. What do you think is the best way to equip accounting students with a broad range of ICT and HOT skills that will prepare them for employment?
10. Do you see the need to make changes to the accounting curricula of the universities to include more relevant ICT and HOT skills in the future? If yes, in what ways? If no, why not?

11. Do you think collaboration with academia, government and accounting graduates is required to promote the development of ICT and HOT skills of accounting graduates to enhance their employability? If yes, in what ways? If not, why not?
12. Other questions/notes

Proposed Questions to Government Officials (35 minutes - 40 minutes)
1. What are the specific roles of your department regarding the development of accounting programmes of public universities in Ghana?
2. Describe government policies for the education and training of university accounting students to enhance their employment after graduation?
3. In your opinion, are accounting graduates currently encountering employment challenges in Ghana? If yes, in what ways? If no, why not?
4. What ICT and HOT skills do you think accounting students should possess upon the completion of their accounting programme to enhance their employability and performance of at the workplace?
5. In your opinion, are the curricula of public universities able to satisfy the skills requirements of employers in the wake of the Fourth Industrial Revolution (4IR)?
6. What do you think is the best way to equip accounting students with a broad range of ICT and HOT skills that will prepare them for employment?
7. Do you see the need to make changes to the accounting curricula of the universities to include more relevant ICT and HOT skills in the future? If yes, in what ways? If no, why not?
8. Do you think collaboration with academia, employers and accounting graduates is required to promote the development of ICT and HOT skills of accounting graduates to enhance their employability? If yes, in what ways? If no, why not?
9. Other questions/notes