EMPLOYABILITY SKILLS FOR PROFESSIONAL ACCOUNTANTS IN THE MIDST OF INDUSTRY 4.0 – A LITERATURE REVIEW -

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Abstract
Most facets of modern life are being transformed in the light of recent technological developments. Similarly, the accounting industry is going through a significant redesign under the influence of Industry 4.0, often known as the Fourth Industrial Revolution, which tackles issues of automation and intelligence and incorporates them into accountants' daily activities. The present research assesses the impact of these changes on the requirements of a work-ready accountant by enclosing the skills relevant for the accounting profession, with a focus on technology relevant skills. The originality of the study lies in its attempt to provide a robust and comprehensive guide to the accounting skill set that ensures the capabilities necessary to thrive in the digitalized accounting workplace of the future. In this way, the research treats both technical (traditional accounting skills) and non-technical skills, but nonetheless, it emphasizes a new set of skills derived from the digital transformation in the context of Industry 4.0. The new skill set addresses the requirements of cyber, digital, and technology competences, which arose from the intensive digitalization of accounting organizations. The paper is a thematic literature review that performs quantitative and qualitative analysis on the literature on accounting and professional bodies in the attempt to define an updated accountant profile in the era of digital technologies. The investigation validates the importance of cyber, digital, and technology skill sets and encourages accountants to upskill their competencies to meet the demands of accounting in the digital era.

Keywords
Employability, accounting, Industry 4.0, skills, technology, literature review

JEL Classification
M41, M42, J24, O33

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Introduction

Technological developments are spreading throughout most aspects of human life (Skhvediani et al., 2022). Recent years in industries are aligned with a fast-paced globalization, and the technological redesign affects most social and economic structures (Dubey et al., 2022). Similarly, the accounting profession is undergoing an extensive redesign through the lens of Industry 4.0, extensively known as the 4th Industrial Revolution, or Industry 4.0, which tackles concepts of intelligence in automation and integrates them into the day-to-day lives of accountants (Bühler et al., 2022).

The outlook on recruitment interferences in the light of Industry 4.0 emphasizes first and foremost the need to gain a deep understanding of employability skills and requirements (Sehgal & Nasim, 2018). Current and future employees are anticipated to undergo an ongoing calibration process based on market changes. The concept of "work-ready" employee that develops already in academia and transitions into the workplace requires a rapid assimilation of knowledge as well as a fast absorption of the nuances of globalization and digitalization (Sehgal & Nasim, 2018). As a reflection of recent demands, graduates' ability to reach their potential and obtain the correct skill set is under high scrutiny in the field of academic research. In this sense, the most up-to-date scheme of the account must be well understood and analyzed.

Changes in hiring patterns and the body of literature (Dolce et al., 2020; O'Shea et al., 2022; Burriel et al., 2023) support the assumption that there is a skill gap in accounting. In this sense, companies turn to outsourcing the work of accountants and shifting employment towards technology-related skills rather than traditional accounting competencies (Moore and Felo, 2022). Barry Melancon, chief executive officer (CEO) of the Association of International Certified Professional Accountants, states that even in graduate hiring, fewer accounting professionals will be hired due to this shift in hiring patterns (Tysiac, 2020). The range of accounting skills is expanded to a variety of technical skills besides the traditional accounting-related knowledge (O'Shea et al., 2022). This triggers a change in the very role of the accountant that shifts away from its traditional requirements. Such disruptions are constantly hitting the accounting profession and the landscape of professional skills, requiring sustained monitoring and updating of the accounting profile (Roy, 2022).

At the same time, there is an increased focus on employability studies that investigate the "ability to get initial employment, maintain employment, and obtain new employment if required" (Hillage & Pollard, 1998). Generally, employability studies have focused their attention on the identification and correct exploitation of soft skills (Dubey et al., 2022; O'Shea et al., 2022) Nevertheless, due to technological developments and the advent of new technologies, extended focus needs to be placed on the technical requirements that new technologies bring to accounting. The current research will therefore base its scope on the employability skills of new accountants in the context of the Fourth Industrial Revolution. This revolution is also known as Industry 4.0, or the revolution of intelligent automation (Bühler et al., 2022).

Accounting education takes an interest in defining the optimal accountant profile. The requirements of the International Accounting Education Standards (IEASB) are incorporated into the curriculum of accounting education programs. IFAC members require a strict set of skills consisting of technical competence, professional skills, attitudes, values, and ethics (Kwarteng & Mensah, 2022). The science of employability discusses soft skills often (Dubey et al., 2017; Loday & Drakpa, 2021; Kwarteng & Mensah, 2022) in the attempt to shed light on the non-subjective skills that were considered not sufficiently covered by the curricula. However, even the technical abilities that were typically taught in traditional curricula are not given enough attention in the age of technology. This is causing even more lag in the ability of professional accountants (PAs) to cover the skill gap.

The current paper is engaging in a proactive course of action by reviewing the literature on accounting skills so that the optimal accountant profile in the age of the 4th Industrial Revolution is obtained. The study reveals three categories of skills, adding to the traditional technical and non-technical skills a separate one that contains the development of technological skills required by the Industry 4.0 revolution.

The originality of the study stands in the fact that it draws a picture of the entire skills landscape, nonetheless with a focus on cyber, digital, and technology skills as they are required in current times.

The structure of the paper follows a systematic approach by first introducing the theme of accounting skills in the context of Industry 4.0, then a deep dive into employability topics and skill sets. The next chapter describes the methodology, while the last chapter shows the results. Lastly, the paper discusses the implications of the findings, conclusions, and further research.

1. Review of the scientific literature

Employability studies that target the area of accounting take a targeted approach to analyzing the skill set that optimizes the accountant's profile. The purpose of employability work is to define the skill set that increases the possibility of obtaining employment. In this sense, different angles are attempted in research work to either formulate the perceptive optimal skill set for employment prospects or to better understand the different perceptions between skill possession and skill relevance for future graduates.

The concept of employability offers a range of definitions, while a clear and homogenous interpretation is still lacking within the literature. The multi-faceted and elusive characteristic of employability makes it difficult to contain it (Cranmer, 2006). Employability is perceived as the ability to obtain and retain formal employment (Hogan et al., 2013). Similarly, employability is seen as the the capacity to “move self-sufficiently within the labor market to realize potential through sustainable employment ” (Harvey & Knight, 2005). Another definition sees employability as a cumulation of the attributes needed by a graduate student to obtain, retain, and grow in their job (Senan & Sulphey, 2022). Regardless of the strict definition of employability, whether it

is seen as a process or a competence acumen, it is important to address all facets of research on employability.

Simultaneously, the accounting literature tries to identify the different skill groups that are relevant for the profession. The term "competence" is referred to at the European level when referring to attitudes, capabilities, and skills that exist within the borders of the accounting profession (Burriel et al., 2023). The large spectrum of competences requires proper segregation, which leads to a generally accepted generic split between technical and non-technical skills. Technical skills refer to business knowledge and software handling capabilities (Hayes et al., 2018; Atanasovski & Trpeska, 2018; Ebaid, 2022). Non-technical skills revolve around behavioral competencies such as communication and problem-solving skills (Hussein, 2017; Beenen et al., 2018; Arquero et al., 2022; O'Shea et al., 2022). Non-technical skills are thought to result from the proper application of technical skills, such as presentations or decision-making. At the same time, technical skills are seen as the capacity to apply and consolidate specific knowledge and skills in real context and work (Hadiyanto et al., 2021). The naming convention is not calibrated within literature, thus presenting little uniformity. In this sense, technical skills are also called hard skills (Dolce et al., 2020), while non-technical skills are also called soft or enabling skills (Hussein, 2017; Atanasovski & Trpeska, 2018). The terminology will be used interchangeably throughout the paper, referring to the same groups of skills: technical and enabling.

Firstly, the literature tries to define the skill set that best serves the purpose of employability. Some research defines a set of skills that are considered most relevant for employment in accounting and pursues the task of assessing their existence within the academic curriculum. One example of a skill set landscape proposition splits skills into: communication, teamwork, leadership, management, and digital technology skills, while concluding that the digital skills are lacking in the curricula of the studied universities, which could probably cause issues in the future for them (Banasik & Jubb, 2021). Another study acknowledges the evolution of the accounting profession and compares skills required in early career compared to future roles. They conclude that future roles will require some essential skills such as technology-enhanced roles (digital, data, and analysis) and some creativity into adding value to a business using these skills (Bowles et al., 2020). Further studies outline the skills needed for accountants to succeed in their profession. According to International Educational Standards IES No. 3 (IES, 2014), are defined as intellectual, personal, communication, and organizational skills, while IES No. 4 (IES, 2014b) addresses the topic of ethics and appropriate attitudes (Mistry, 2021).

Secondly, literature is attempting to reconcile the views of practitioners and organizations when it comes to their assessment of skill importance or relevance in the hiring process or during regular operations. The gap between skill possession and the skills that markets need threatens societies and blocks them from achieving sustainable growth (Atanasovski & Trpeska, 2018). In this sense, one researcher compared a large set of technical and generic skills between the views of students and employers and their assessment of relevant skills for good career performance. In terms of technical skills,

the highest perceptive differences are represented by accounting software, where students assess its importance much higher than employers. Indeed, AIS is nowadays sufficiently performant that its operational knowledge can be easily obtained as employment. This conclusion is validated by a reduced importance assigned by employers in this area. Another finding of the study sees similarities in perceptions of the importance of ICT knowledge. This conclusion is supported by a general high statistical mean, concluding the importance that technology has in accounting (Atanasovski & Trpeska, 2018).

Generally, employability work focuses on soft skills such as interpersonal and teamwork (Twyford & Dean, 2023) or leadership and organizational skills (Dubey et al., 2022), but little research addresses the ever-growing and changing hard skills set that derived from the 4th industrial revolution. The totality of technical skills, which were stagnant for a large period, are now entering the spotlight again as they require new foundations for development in light of new technology entering the market. In this sense, we mention that advanced IT and programming skills (ACCA, 2020; Al-Hattami, 2021), qualitative and statistical skills (ACCA, 2020), data analysis and data engineering (ACCA, 2020; Aldamen et al., 2021; Hayes et al., 2018; Roy, 2022), and troubleshooting, user experience, systems analysis, and evaluation skills (WEF, 2018), are critical in constructing an exhaustive collection of skills demanded within the accounting field.

In this sense, the current research aims to cover a gap in the literature on accounting employability that tends to address the topic of soft skills while limiting hard skills under the assumption that hard skills are taught in universities. The oversight comes from the recent dynamic in hard skills with the advent of digitalization. These skills are not covered by universities but are discussed by professional bodies and are required in the job market. This creates an employability challenge among practitioners. The current paper will focus on a mix of skills that are relevant for the accounting profession considering innovation in accounting technology.

2. Research methodology

A search and review of academic studies addressing accountants'' skills were performed. This was followed by a thematic analysis aiming to identify the main group of skills emerging from the existing literature. Initially, we performed a systematic review of academic publications to collect academic studies on skills emerging due to the digital transformation of the accounting profession. The analysis is based on sourcing relevant publications by launching a keyword search on the Web of Science platform. The employed keyword combinations were: ("skill*" OR "competence*" OR "ability*" OR "attitude*") AND ("accounting" OR "audit*"). The search targeted the publications by analyzing the "Title" because it is considered the most relevant and revealing component of an article, which ensures the results of the search are in correlation with the subject. The analyzed period is 2014–2023 because it is considered that significant technological progress has appeared within the last ten years for the accounting profession. As research areas, the search was limited to Business Finance or

Business or Management or Education Educational Research or Economics or Social Sciences Interdisciplinary or Multidisciplinary Sciences or Behavioral Sciences or Computer Science Information Systems or Environmental Sciences or Green Sustainable Science Technology or Computer Science Artificial Intelligence or Education Special or Education Scientific Disciplines or Ethics or Computer Science Interdisciplinary Applications or Computer Science Theory Methods (Web of Science Categories). The search was performed in Web of Science Core Collection, on August 19th, 2023. Initial sample included 357 entries.

The first analysis was performed directly in the Web of Science web portal, and it was a fast review of titles. Within the titles, the most relevant potential articles have been marked for further analysis. After this initial review, a total of 117 articles have been marked in Web of Science for further review. An extraction of the selected articles changed the analysis platform to Excel. As such, the 117 articles have been individually analyzed via abstract reading to verify if they match the theme of the paper. The focus of the research is to find the most relevant accounting skills, with a deep focus on those skills that are relevant for the evolution of digital technologies in accounting.

To ensure targeted selection of sources addressing the relevant research domain, we conducted a comprehensive screen of search results, through which sources covering unrelated topics were filtered out. Adopting the authors' approach, we reviewed journal article abstracts and introductory sections of book chapters in all 117 publications to exclude those whose content was not related to the accounting profession's skills. Following this process, we excluded book chapters and journal articles that mention skills in different contexts as educational methods or other fields irrelevant to this study. Moreover, we excluded those sources that only mention the word skills without engaging in a more analytical debate concerning the skill content. This resulted in a total of 100 academic publications that explicitly address the accounting profession's skills and have the potential to provide a robust and comprehensive set of skills, which will be discussed in the results section, together with the relevant skills that they illustrate.

Through a literature search, we tried to find the most relevant articles related to skills in accounting. Table 1 shows the articles in question, along with the publication year and number of citations. The logic for selecting the 22 articles from the initial sample was made based on several considerations. One main consideration was their potential to touch as many skills as possible and thus portray a complex image of the skill landscape in the accounting industry. Secondly, the selection was made based on those articles that provided an image where skills from all categories have been illustrated, with a focus on skills related to the 4th Industrial Revolution.

Table no. 1. Articles selected for skill extraction

Author	Article	Publishing Year	Citation Number
Leitner-Hanetseder, et al., 2021	A profession in transition: actors, tasks and roles in AI-based accounting	2021	88
Douglas & Gammie, 2019	An investigation into the development of non-technical skills by undergraduate accounting programmes	2019	77
Aryanti & Adhariani, 2020	Students' Perceptions and Expectation Gap on the Skills and Knowledge of Accounting Graduates	2020	51
Tan & Fawzi, 2017	Employability skills required of accountants	2016	27
Dow, et al., 2021	A Framework and Resources to Create a Data Analytics-Infused Accounting Curriculum	2021	16
Al-Hattami, 2021	University Accounting Curriculum, IT, and Job Market Demands: Evidence From Yemen	2021	16
Daff, 2021	Employers' perspectives of accounting graduates and their world of work: software use and ICT competencies	2021	16
Cernusca, 2020	Soft and hard skills in accounting field-empiric results and implication for the accountancy profession	2020	13
Kwarteng & Mensah, 2022	Employability of accounting graduates: analysis of skills sets	2022	9
Hayes, et al., 2018	Role of tax knowledge and skills: what are the graduate skills required by small to medium accounting firms	2018	8
Osmani, et al., 2020	Incorporating Information Communication Technology Skills in Accounting Education	2020	7
Salam & Hasan, 2020	The generic skills gap in curricula: Are Thai accounting graduates ready for the contemporary workplace?	2020	2
Arquero, et al., 2022	Non-technical skills and students' overconfidence in accounting	2022	1
Roy, 2022	Graduate readiness for a professional career in accounting – an investigation of employers' perspectives in Fiji	2022	1
Burriel, et al., 2023	Relevant competences in accounting. The perspective of students and employers	2023	1
Aldamen, et al., 2021	Core competencies for the global workplace: A cross-cultural and skill-based simulation project in accounting	2021	0
Karcioglu & Binici, 2023	Developing a maturity model to identify digital skills and abilities of accounting professionals: evidence from Turkey	2023	0
Yigitbasioglu, et al., 2023	Digital Transformation and Accountants as Advisors	2023	0
Yudin, et al., 2021	Competence approach to academic and professional training of auditors of information systems and technologies	2021	0
Bunea & Guinea, 2023	Stakeholders' Perceptions of the Vocational Competences Acquired by Students Enrolled in Accounting Master's Programmes in Romania	2023	0
Elo, et al., 2023	Transformation of skills in the accounting field: the expectation-performance gap perceived by accounting students	2023	0
Tsiane & Motebang, 2023	Accounting teachers' curriculum perspectives towards the accounting syllabus	2023	0

Source: Author`s compilation based on relevant articles

At the same time, the research investigated the skills that appear in the accounting literature. The following step considered each article's content and extracted all relevant skills that the articles referred to from the initial set of articles, the 100 articles referring to skills in accounting. The initial extraction resulted in 178 different skills that presented high variation in terms of granularity. This means that while some papers referred to specific skills, such as database program knowledge, other articles referenced technical skills as an umbrella that incorporates many other skills. The set of extracted skills was grouped per category into smaller categories based on similarities, resulting in a total of 22 groups of skills. The groups of skills will be further discussed in the results section.

The whole set of articles was quantitatively analyzed using Vos Viewer and Biblioshiny. The purpose of the quantitative analysis is to see the trends in the literature

concerning professional accountant skills. Subsequently, the selected sample was qualitatively analyzed to extract the main skills mentioned in the literature.

3. Results and discussions

3.1. Quantitative results

The articles that have been considered relevant for the current research treat the topic of skills or competences required by the accounting profession. The publishing years, as displayed in Figure 1, show the high interest that recent years have dedicated to the topic of skill sets. This suggests that the change in the accounting profession is indeed triggering a reconfiguration of the skill set, which has been a subject of interest within the literature in recent years.

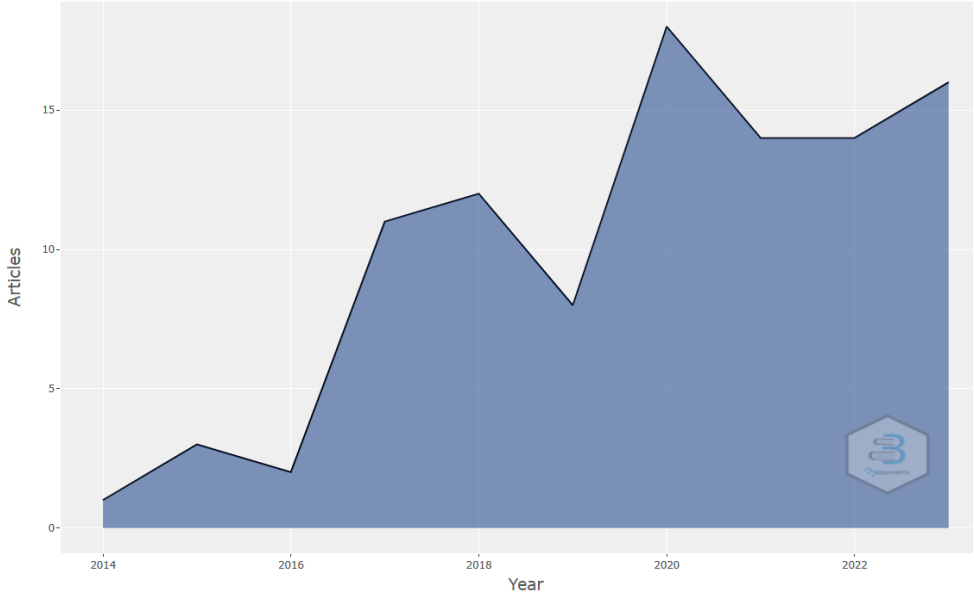

Figure no. 1: Count of articles by publishing year
Source: Author's processing of data in Blibliometrix

At the same time, the citation number shows that the most cited articles belong to the publishing years 2021 and 2020. Citation volume is dynamic and dependent on the period in which they are available for further reading and quoting. It is expected that older articles display a higher citation volume.

Similarly, the list of the most cited sources shows a very large number of articles from journals such as Accounting Education, which, as shown in Figure 2, belong to one of the prevalent publishers, meaning Taylor & Francis.

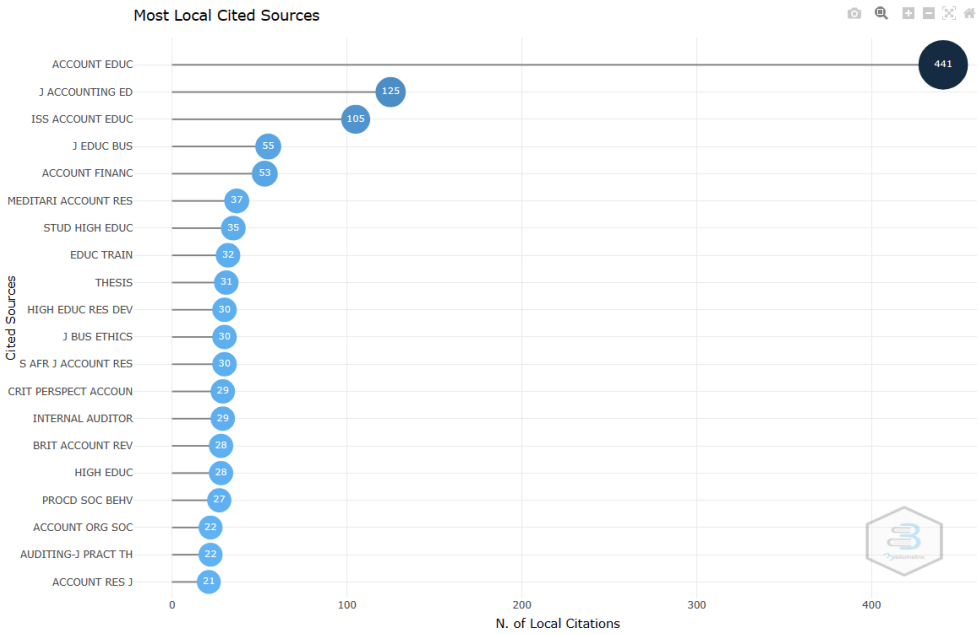

Figure no. 2: Most cited sources
Source: Author's processing of data in Blibliometrix

Further quantitative analysis of the articles in scope can validate the relevance and accuracy of the information provided. Top publishers such as Taylor & Francis, Emerald Publishing, and the American Accounting Association can ensure that the articles selected offer high quality in their reports and findings. Figure 3 shows the list of the most common publishers that are found within the selected article sample.

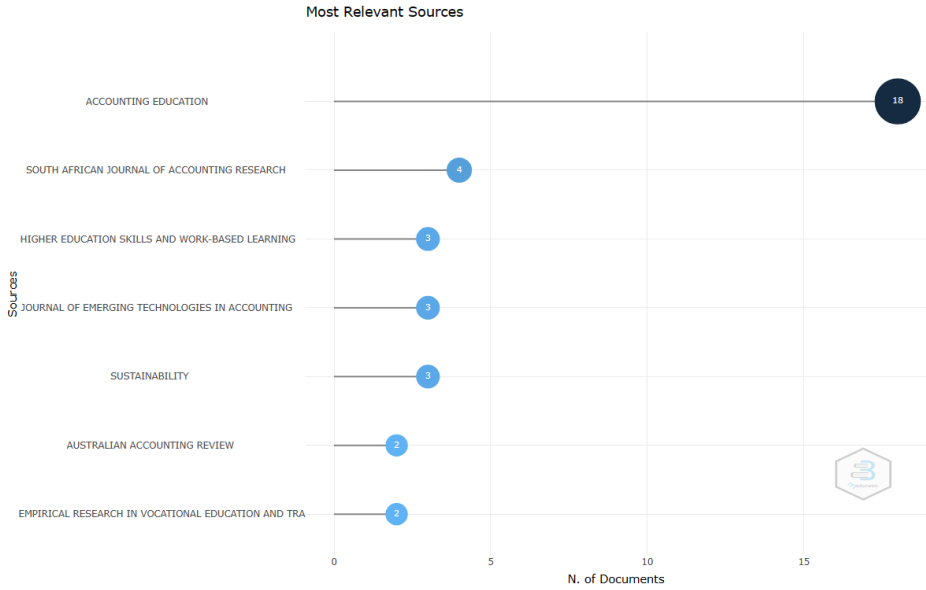

Figure no. 3: Top publishers
Source: Author's processing of data in Blibliometrix

Another bibliometric analysis tries to find relationships between the relevant country for each article, the keywords, and the keywords plus. High interest is seen in South Africa and Australia in relation to the topic of employability skills in accounting. Strong correlations in terms of keywords appear for accounting education, soft skills, and generic skills, but also professional skills and technical skills cover a large part of the interest within the literature, as seen in Figure 4.

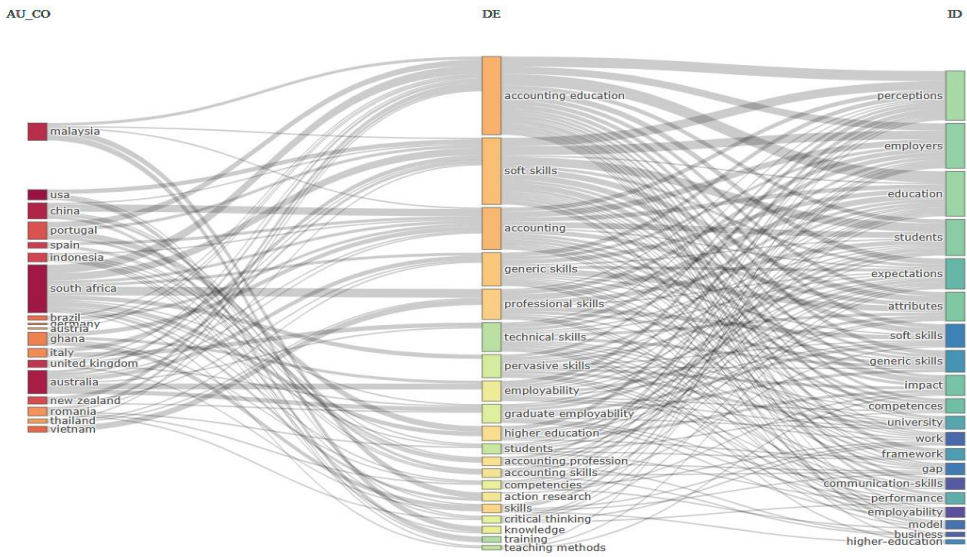

Figure no. 4: Relationship between country of origin, keywords and keywords plus
Source: Author's processing of data

Lastly, the keywords have been visually portrayed with the help of Vos Viewer, resulting in the matrix shown in Figure 5. The results are in line with the current analysis, delimitating first the accounting profession, the interest in competences, and even more employability-related competencies. The perspective of employability pursuit is also illustrated in the keyword's matrix. Further on, the topic of skills appears, showing the split between generic or soft skills, which have a high interest within literature, and professional and technical skills.

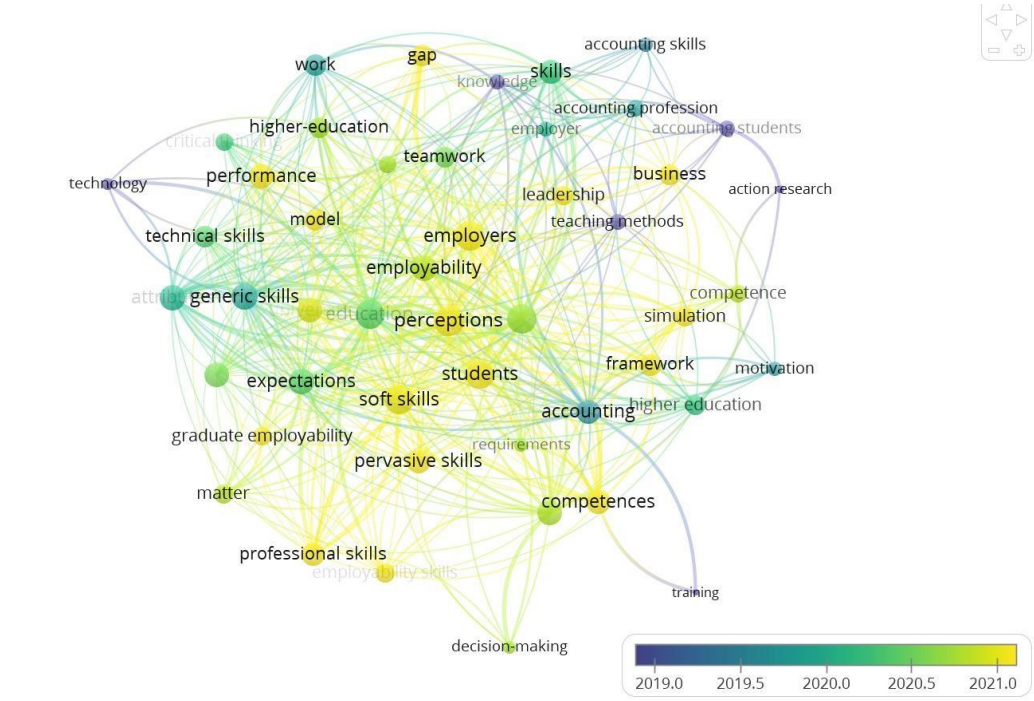

Figure no. 5: Visual display of keywords landscape
Source: Author's processing of data in VosViewer

In conclusion, the results emphasize the high interest that literature has dedicated to the topic of skills. The topic is relatively new, with a peak in 2020; nonetheless, it generated high levels of interest worldwide, as the geographical distribution shows many areas interested in the subject. The quantitative analysis validates the accuracy of the information provided by revealing the top publishers as the most cited ones. In the next chapter, the results from a qualitative perspective will be presented.

3.2. Qualitative results

The research investigates the skills that appear in the accounting literature. In general, the accounting literature reveals two main skill categories. The two categories are technical skills (Hayes et al., 2018; Atanasovski & Trpeska, 2018; Ebaid, 2022) and non-technical skills (Hussein, 2017; Beenen et al., 2018; Arquero et al., 2022; O'Shea et al., 2022). Nonetheless, the current research focuses on the selection of all relevant skills of the accounting profession, with a special focus on those skills relevant in the context of the Fourth Industrial Revolution.

The articles within the scope of the research have been analyzed with the purpose of skill extraction. The articles had various granularity levels, discussing either niche or well-defined competencies in accounting while also incorporating several groups under

the umbrella of one skill category. The results of the analysis were intended to reduce the number of skills and group them into categories, thus revealing 22 different skills. Table 2 depicts the landscape of skills that have been found to be relevant for the accounting profession in the context of Industry 4.0. The groups of skills have also been further grouped into three distinct categories, one of which is technical skills, meaning the relevant skills for properly conducting activities in accounting and business areas (GAA, 2020). Secondly, the paper addresses the group of skills named enabling or soft skills, which tackle topics of communication and problem solving (Arquero et al., 2022). The third group of skills is a new category that results from the advancements in innovation and digital transformation of organizations in the context of Industry 4.0. The group has been named cyber, digital, and technology skills and could be a branch of technical skills. The new category of skills has increased visibility in recent years in the accounting literature and is expected to have increased importance in the years to come (Leitner-Hanetseder et al., 2021; Moore and Felo, 2022; Kwarteng & Mensah, 2022).

Table no. 2. Skill groups within literature

Technical skills	Cyber, digital and technology skills	Enabling skills
Financial Accounting	Advanced IT skills and programming	Complex information processing and interpretation
Management Accounting	Basic digital skills	Decision making and problem solving
Auditing	Analytical skills / Data enquiries	Communication skills
Taxation	Advanced data analysis and mathematical skills	Leadership skills
Corporate Governance, Risk Assessment, and Internal Control	General computer skills (Word, Excel, Windows, Internet)	Initiative, innovation and change mindset
Industry knowledge	AIS	Ethics and public interest
Process improvement & Performance management	New technology skills (AI, RPA, Cloud, Blockchain, etc.)	
	Knowledge of database software	
	Technology design and programming	

Source: Author`s compilation based on skills extracted

Accounting graduates are expected to possess technical skills or basic accounting knowledge such as financial accounting (Aryanti & Adhariani, 2020; Leitner-Hanetseder et al., 2021; Burriel et al., 2023; Bunea & Guinea, 2023; Osmani et al., 2020) and Management Accounting (Aryanti & Adhariani, 2020; Burriel et al., 2023) to secure employment in the job market (Aryanti & Adhariani, 2020). The basic accounting knowledge is required throughout the industry and thus not specifically treated within the literature, as it is expected that universities focus extensively on subject-specific skills, even though the accounting role is in a constant evolution from its initial role as a number-crunching position (Aldamen et al., 2021). One study treats the classical roles of accounting and positions them in a world of human-machine collaboration, constructing a hybrid model in which AI and accountants work together to fulfill the financial accountant role (Leitner-Hanetseder et al., 2021). Table 3 displays the interest that the articles place on the group of technical skills, validating the relevancy of basic skills while simultaneously showing a focus on process improvement, industry knowledge, and corporate governance, thus indicating the evolution of the profession.

Table no. 3. Technical skills as illustrated in the scope articles

		Aryanti & Adhariani, 2020	Aldamen et al., 2021	Al-Hattami, 2021	Burriel et al., 2023	Bunea & Guinea, 2023	Elo et al., 2023	Kwarteng & Mensah, 2022	Leitner-Hanetseder et al., 2021	Osmani et al., 2020	Sarapaivanich et al., 2019	Roy, 2022	Tan & Fawzi, 2017	Tsiane & Motebang, 2023
Technical skills	Financial Accounting	x		x	x	x	x	x	x	x	x		x	x
	Management Accounting	x			x						x			
	Auditing				x				x	x	x			
	Taxation	x									x			
	Corporate Governance, Risk Assessment, and Internal Control	x			x					x	x			
	Industry knowledge									x	x	x		
	Process improvement & Performance management		x							x				

Source: Author`s compilation based on technical skills set

Secondly, the accounting literature tackles the topic of Industry 4.0-related skill sets, which vary from basic computer skills (Hayes et al., 2018; Cernuşca, 2020; Arquero et al., 2022; Bunea & Guinea, 2023) to new technology skills such as AI, RPA, Cloud or others (Leitner-Hanetseder et al., 2021; Elo et al., 2023; Karcioglu & Binici, 2023; Yigitbasioglu et al., 2023), as seen in Table 4. These technology-related skills are approached within the literature from various angles. The study of Elo et al. (2023) starts with the presumption that the world of accounting has changed due to extensive digitalization of the industry and confirms the expectation performance gap in accounting students for skills such as knowledge related to robotics and artificial intelligence or programming skills. A different analysis focuses on a lack of talent and skills in relation to evolving technologies in accounting (Karcioglu & Binici, 2023). In general, there is high interest in the development of new skills in accounting, while a general agreement exists that at least basic digital skills are already required by the profession (Aryanti & Adhariani, 2020; Arquero et al., 2022; Elo et al., 2023; Yigitbasioglu et al., 2023).

In the late 1990s, it was predicted that the utilization of computer applications in education were expected to change the face of university accounting, as "a narrow, technical, and procedurally based view of the discipline no longer reflects the reality of the nature of accounting work" (Boyce, 1999). Nowadays, the digital transformation is well advanced, and literature discusses the inadequate technological knowledge that

exists in practice. It is said that trainee accountants must work with the application of IT skills more than technical knowledge in the workplace. At the same time, it is said that companies are looking for employees with technological experience in the first place (Oben et al., 2021).

Several authors emphasize the importance of Information and Communication Technology (ICT) skills in today's corporate climate, citing competency in using various software and tools as an essential strategic difference for future accounting and finance graduate-employees (Osmani et al., 2019). Nevertheless, accounting graduates are said to be missing the importance of computer skills (Gaviria et la., 2015; Ezeani & Akpotohwo, 2014).

Table no. 4. Cyber, digital and technology skills as illustrated in the scope articles

		Aryanti & Adhariani, 2020	Aldamen et al., 2021	Al-Hattami, 2021	Arquero et al., 2022	Burriel et al., 2023	Bunea & Guinea, 2023	Cernușca, 2020	Dow et al., 2021	Daff, 2021	Elo et al., 2023	Hayes et al., 2018	Kwarteng & Mensah, 2022	Karcioglu & Binici, 2023	Leitner-Hanetseder et al., 2021	Osmani et al., 2020	Sarapaivanich et al., 2019	Roy, 2022	Yigitbasioglu et al., 2023	Yudin et al., 2021
Cyber, digital and technology skills	Advanced IT skills and programming			x					x						x	x			x	x
	Basic digital skills	x		x	x			x	x		x			x	x	x	x	x	x	x
	Analytical skills / Data enquiries	x	x				x	x	x		x			x		x		x	x	x
	Advanced data analysis and mathematical skills	x										x				x				x
	General computer skills (Word, Excel, Windows, Internet)			x	x	x	x	x		x			x	x		x			x	x
	AIS	x				x	x	x		x				x		x			x	x
	New technology skills (AI, RPA, Cloud, Blockchain, etc.)										x			x	x				x	
	Knowledge of database software				x								x							
	Technology design and programming							x			x			x					x	

Source: Author`s compilation based on the cyber, digital and technology skills set

Lastly, the topic of soft skills is still one of the most discussed group of skills within literature. Research states that recruiters in accounting have shared their preference to hire practitioners with various experiences, if they possess good intellectual abilities and natural strengths (Douglas & Gammie, 2019). The issue surrounding these skills is that universities are intrinsically limited to basic accounting knowledge and insufficiently include developments in non-technical areas (Salam & Hasan, 2020). Moreover, due to the subjective nature of these competencies, literature studies compare their perceptions among accounting graduates. Arquero et al., (2022) find that students are overconfident in their possession of certain soft skills when compared with the opinions of employers.

Table 5 presents the list of enabling skills found and discussed within the selected articles.

The importance of developing soft skills as emotional intelligence and incorporating them into the accounting curriculum is being discussed within the literature (Carvalho & Almeida, 2022), together with a discussion around whether the skills should be included in university programs. It is expected that accounting graduates have higher chances of securing jobs within Big Four companies with a background in digital skills, whereas smaller organizations tend to prioritize technical skills and interpersonal competences rather than communications and analytical skills (Aryanti & Adhariani, 2020).

Table no. 5. Enabling skills as illustrated in the scope articles

		Aryanti & Adhariani, 2020	Aldamen et al., 2021	Al-Hattami, 2021	Arquero et al., 2022	Bunea & Guinea, 2023	Cernușca, 2020	Dow et al., 2021	Douglas & Gammie, 2019	Elo et al., 2023	Leitner-Hanetseder et al., 2021	Osmani et al., 2020	Sarapaivanich et al., 2019	Salam & Hasan, 2020	Roy, 2022	Tan & Fawzi, 2017	Tsiane & Motebang, 2023	Yudin et al., 2021
Enabling skills	Complex information processing and interpretation	x	x		x	x	x	x	x	x	x	x				x	x	x
	Decision making and problem solving	x		x		x	x			x	x	x		x				x
	Communication skills	x				x						x		x	x			x
	Leadership skills		x			x	x					x		x	x			
	Initiative, innovation and change mindset	x					x			x					x			
	Ethics and public interest	x		x	x	x							x	x	x			

Source: Author`s compilation based on enabling skills set

The literature presents the topic of digitalization and skill sets in correlation with the topic of curricula (Berikol & Killi, 2021). The curricula present challenges in fast adapting to the skill set changes, while signs of under-preparedness of practitioners are visible in the job market (Aldredge et al., 2020). The skill gap is deepening in the accounting job market, and efforts are constant in identifying the skill profile of the future accountant (Bakulina et al., 2020; Kokina et al., 2021; Vincent et al., 2020). Accounting knowledge and abilities are crucial in practice since they are part of a data processing system that provides critical data about an enterprise's accounting treatments. The goal of accounting education is to equip accountants with insight and expertise into the processing procedures used by businesses to make key decisions.

In conclusion, the skill gap triggered by the 4th Industrial Revolution is multifaceted and extends over numerous areas within the accounting landscape. Literature does not fall short in trying to analyze and reconcile the skill gap (Österreich & Teuteberg, 2019; Pilipczuk, 2020; Kokina et al., 2021). Academia should be the front line in addressing the gap between workplace requirements and the capabilities of practitioners (Aldredge

et al., 2020). The current research lays out a groundwork analysis that can serve as a basis for practitioners worldwide to tackle the missing skills.

Deciphering and validating the optimal accounting competence profile is not a new topic within specialized literature (Aldamen et al., 2021; Daff, 2021). Seemingly, the fast-paced dynamic of the skills that best represent the accounting workforce requirement is attributed to the process of digital transformation, a process that most companies have already embarked upon (Leitner-Hanetseder et al., 2021). Maintaining a competitive advantage in such a changing environment requires that accountants constantly upgrade their skill set based on market needs. This, in turn, implies that academic research presents the most updated view on the evolution of skill sets for current and future employees.

In response to this, the current paper investigates the skill set relevant for the accounting profession. The skill set is first extracted from the specialized literature and then validated against a predefined framework. Accountants must keep up with the transformation of the accountant profile to remain competitive. In this way, all practitioners must constantly monitor the nuances that alter the accounting skill set required in the pursuit of employment.

The objective of the study was to identify the most up-to-date set of accounting skills that can contribute to an increased employment rate. The focus of the study revolved around the topic of the 4th Industrial Revolution and understanding the impact it brings to the accountant profile. In this sense, a deep analysis of the accounting skills found within specialized literature was performed. All the skills extracted could be grouped in three distinct categories. To better understanding the effect of Industry 4.0, the expansion of cyber, digital, and technological skills was done. The expansion of the group was validated by literature, which finds similar skills as included in the category of cyber, digital and technology (Leitner-Hanetseder et al., 2021; Moore & Felo, 2022; Kwarteng & Mensah, 2022; Arquero et al., 2022).

In general, the study tackles the topic of skills in the context of Industry 4.0, similar to a general interest found within the literature where information technology competences are rated as strongly relevant (Leitner-Hanetseder et al., 2021; Ebaid, 2021). The research is based on quantitative and qualitative analysis of relevant articles, which were used as the basis to extract a comprehensive list of skills required within the borders of the accounting profession in the midst of the 4th Industrial Revolution.

Extant research defines accounting skills as attitudes and abilities that enable practitioners to pursue work in the field (Burriel et al., 2023). The division between technical and non-technical skills is accepted throughout most studies (Douglas and Gammie, 2019; Dolce et al., 2020; Ebaid, 2021), nonetheless, the accounting literature fails to focus on digital competences as a separate group in the analysis of the accounting profile and rather includes these under the umbrella of technical skills. The originality and value added of the current paper comes from making a clear distinction between those skills that are relevant from a digital perspective, considering the innovation demanded and put forth by the 4th Industrial Revolution.

Accounting studies have long focused on perfecting and continuously updating the academic curricula (Dow et al., 2021; Aldamen et al., 2021; Ebaid, 2022). Studies are even trying to shift the focus from defining the optimum skill set to understanding better how employability is instilled (Osmani et al., 2019). In a similar attempt, the current study focuses on an expanded skill set that increases the chances of obtaining employment for accounting practitioners, as it takes into consideration a new set of skills invoked through the current digitalization trend and the 4th Industrial Revolution.

Prior research demonstrates that technological advancement has an impact on employability (Yoon, 2020; Dow et al., 2021; Ebaid, 2021; Daff, 2021). Accounting curricula should address these findings and try to correlate them with the conclusions of the research. Accounting students need to gain knowledge of cyber, digital, and technology skills. This can be ensured by enhancing the curriculum. As such, this would enable students to optimize their ability to secure employment in the field. A fully integrated academic curriculum should include a focus on new technologies such as big data and data analytics, in line with accounting research (Dow et al., 2021).

A strong collaboration between academia and practitioners is expected to optimize challenges in employment seeking for accounting students (Moore and Felo, 2022). In response to this, the research prepares a base of accounting competences and student`s relationships with them, which can serve as a pillar in constructing a better and stronger accounting curriculum. At the same time, in accordance with field research in accounting, the conclusion enforces the importance of identifying, understanding and investigating technology-related skills relevant for the accounting profession (Daff, 2021).

Conclusions

The foundation for addressing, containing, and enhancing change is research and investigation. The accounting workplace is changing in the face of smart automation and increased connectivity, requiring that graduates possess an even more robust and complex set of skills when entering the workplace. Old and new competencies are intertwining, and the accounting profile is changing.

In these changing times, the current paper addresses the topic of the accounting skill set, extracting, and validating a set of skills relevant for accounting work, both from a technological perspective and a human perspective. In this sense, the current paper grouped the skills relevant for accounting employment, separating them into three distinct categories and incorporating the most updated market needs, according to peer-reviewed literature. The research distinguishes between three sets of skills. Technical skills involve the most up-to-date knowledge required for traditional accounting processes such as financial accounting, management accounting, auditing, taxation and so on.

Literature discusses extensively the capacity of the academic environment to build a sufficient knowledge base for accounting students to succeed in their employment-seeking endeavors (Dow et al., 2021; Al-Hattami, 2021). Nonetheless, the literature

brings forth alternatives to help gain the required knowledge through extracurricular activities. As such, practitioners are urged to engage in free online courses such as Coursera, MIT OpenCourseWare, Codecademy, edX, Udacity, and even use platforms like Youtube (Lin & Hazelbaker, 2019).

The research is limited in its ability to incorporate a larger volume of articles into the analysis and to generate a broader picture of various employability skills in the accounting profession. Another limitation stands in the capacity of the analysis to select a skill set based only on previous accounting research without validating the results against the job market requirements or even the opinions of accounting practitioners. Future research will be directed towards comparing the data set of skills that have been found within the literature against the reality of the job market and practitioners` opinions.

Further developments in the direction of skill set could separate between the pre- and post-COVID eras to better understand the impact of the accelerated digitalization from that period. Studies propose changes that occur post-COVID, including communication mediums and video conferencing techniques instead of a personal, face-to-face approach. They expect major changes due to these novelties (Aldamen et al., 2021). Similarly, another direction that could be considered when analyzing the optimal accountant profile is the globalization of the research. Many studies differentiate between regions, for example, the UK (Arquero et al., 2022), Spain (Burriel et al., 2023), Yemen (Al-Hattami, 2021) or Scotland (Douglas and Gammie, 2019). In this sense, it would be beneficial to not only find the global trend but also to set up some regional benchmarks and extract some to-dos for the developing countries, which are presenting an increase in their digital maturity level.

In conclusion, the current research debates the most recent and up-to-date skill set imposed by the accounting profession when pursuing employment. The novelty of the perspective comes from making a distinction between traditional accounting skills, digital skills, and behaviorally related skills. The future accounting graduates should capitalize on the new abilities that are required by the sector in the context of a world that is focused on digital transformation (Yoon, 2020). The success of accountants in these difficult times depends on their capacity to adapt quickly to the demands of the digital transformation and take a proactive approach to the changing market requirements.

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