The Transformation of the Accounting Profession Within a Digitalized Economy and the Impact on Accounting Education

Sofia Asonitou

Abstract One of the megatrends in the immediate future of entrepreneurship is the digitalization of production, operations and processes. As accountants stand in the intersection of all functions within a business, they have embraced waves of automation over many years to improve the efficiency and effectiveness of their work. Technological advancements are impacting radically the accounting profession and this should activate transformation policies in the accounting educational sector. The present study aspires to explore the influence of digitalization on the accounting profession and its relation to the readiness of Higher Education Institutions (HEIs) to prepare future accountants.

Keywords Digitalization · Accounting education · Accounting profession · Economy

1 Introduction

The new entrepreneurial era is characterized by digitalization. Digital revolution has brought in the fore new forms and meanings for entrepreneurship in the whole world. Giones and Brem (2017) propose the concept of three different types of digital businesses: technology entrepreneurship, digital technology entrepreneurship, and digital entrepreneurship. Each of them has emerged in diverse environments and produce a range of different opportunities for growth. The main enablers of digitalization are "social" and "mobile" (Legner et al. 2017) while internet-of-things, blockchain technology, "big data", "cloud" and "smart" business intelligence (BI) and business analytics (BA) are the applications associated with them. More enablers include robotics and machine learning, the two main technologies for the automation of processes.

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The unique novelties offered by information technology (IT) seem to be very far away from the agriculture—based economy that humans developed up to mid—nineteenth century. In the following centuries when industry-based economy was established, the accounting profession supported and permitted the creation of multinational industrial businesses. Professional accountants in this period have been valuable members of the management team that leads the globalized operations. However, in the last decades we have passed into the post-industrial, information-oriented economy where "knowledge" is the driving force of the world. This evolution is posing concerns about whether the current accounting profession is in place to remain an indispensable member of the economic engine or it will be replaced by the new technological advancements (Ratnatunga 2018). Technological innovations adopted by companies constitute a new challenge for accounting organizations and accountants who struggle to adapt and keep pace with evolving technologies (Fuller and Markelevich 2020). Accountants need new skills and competences in order to survive and offer valuable services to the companies. These skills include apart from accounting technical expertise, a range of soft skills such as agility, communication skills, interpersonal abilities and certainly strong digital skills (Asonitou and Hassall 2019; IFAC 2006; AICPA 1999). Higher Education is responsible according to employers and managers to provide high quality education to future accountants.

The objective of this study is to depict the interconnectedness between digital technology, the accounting profession and the accounting education.

This study aims to (a) present how the accounting profession has evolved and how it is integrated within the digitalized enterprise and (b) to explore how accounting education is changing in order to accommodate the reforms which happen in the changing business world.

2 Theoretical Framework

Digitalization process is far more complicated than digitization. As Schallmo and Williams explain (2018) digitization is a technical process that allows to transform analogue information to a digital format, making it easier to trace, transmit and communicate. Digitalization on the other hand, involves a deep transformation of the organization, including use of digital technologies, strategy and possibly a new business model to follow. These changes signify an organizational, technical and even cultural shift within a business (Knudsen 2020). A digitalized company uses natively digital data, changes business processes and uses digital information and communication at the core of its operations and strategy (Schallmo and Williams 2018, p. 6). New technology and new business models create a secure environment for enterprises to share valuable data with others within an ecosystem. For example, twenty-eight European automakers and partners in a value chain of key manufacturers, suppliers, and tech companies, joined forces during Covid-19, to launch "Catena-X" platform. This was a data exchange ecosystem that permitted to share information on their own terms with privacy and security guaranteed (Deloitte 2022).

Technology and digitalization are the causes for the creation of new business models (Legner et al. 2017). Enterprises experience huge socio-technical transformation that overturns their organizational structure and strategies (Legner et al. 2017). Technological developments in Business intelligence, Artificial intelligence, robotics, analytics, Blockchain, machine learning and big data, are reshaping the world as we know it already. Digitalization signifies reforms in economies, societies and professions. Covid-19 pandemic crises have accelerated the pace of technological changes.

In this environment, preoccupation has appeared with regards to which professions face extinction and which will survive in the new era. Amongst them is the accounting profession for which inevitably new knowledge horizons and skillset should be designated by stakeholders. Digitalization of enterprises jointly moves with the digitalization of the accounting tasks and the shifting of accountants' duties towards higher demanding roles. Public accounting organizations (PAOs), policy makers, governmental agencies and academics urge to re-invent the profession in order to survive and even thrive in the new digital-oriented world (CGMA 2019). The accountant in its new role as advisor in the management team, participates to systems design, implementation and strategy, while every transaction, either physical or digital, will have to go through the accounting or ERP system. Successful adaptation of accountants to the new technological era presupposes they have acquired the indispensable skills and competences during their studies in Higher Education Institutions (HEIs). Insight on how these fields are interrelated will help both accountants and accounting academics to move in a faster pace towards adaptation of the technology.

Researchers and professionals argue that more research is needed in order to clearly define how the role of accounting professionals is going to change in selected fields.

This leads to the first research question of this study:

Research question 1: How has the accounting profession evolved and how is it integrated within the digitalized enterprise?

This study aims at identifying major current trends and offering an overview of recent research topics. Changes in the accounting profession should activate modifications in the accounting curriculum and the skillset in order to better prepare future accountants in Higher Education Institutions (HEIs). However, there should be concern on the level of readiness of HEIs to accept, organize and implement changes in the curriculum that mirror changes in the accounting profession due to digital business transformation. The leads to the second research question of this study:

Research question 2: How is accounting education responding to the reforms in the digital oriented business world?

The remainder of the paper is structured as follows: Section three presents the methodology while sections four and five provide the results of the review. Conclusions and future research are presented in Sect. 6.

3 Methodology

We conducted a literature review among recent studies and publications which analyse the changes in the accounting profession and the impact on the accounting education. We have used as main key words: "digitalization", "digitization" and "accounting profession", "accounting education" and "information technology". We have identified studies published by the big four auditing and consulting companies and the International federation of accountants (IFAC). The databases we have used are google scholar, research gate, and specific scientific journals such as "accounting education" "international journal of accounting information systems", "journal of accounting education" and "Journal of Emerging Technologies in Accounting".

4 The Accounting Profession

Frey and Osborne (2013) examined how susceptible jobs are to computerization in the light of IT radical advancements. According to this study, bookkeeping, accounting and auditing were among the occupations that should expect to be at risk due to computerization. Since then, this study stimulated a series of articles which reproduced the idea that the accounting and finance professions are in the brink of extinction and their role is redundant in an information driven era. These claims have caused the attention of professionals and authors who explained the misquoted information by the media. Firstly, Frey and Osborn, talked about tasks within jobs—not the jobs themselves and secondly the articles did not recognize that the freed-up time of accountants could be used to perform new insightful tasks within jobs (CGMA 2019). The same perspective of rapidly changing tasks within the finance and accounting industry was given by Accenture (2015): "Transactional tasks will move to integrated business services solutions that use robotics, which will automate or eliminate up to 40% of transaction accounting work by 2020".

Other researchers express the idea that accounting needs to develop a new paradigm in order to keep pace with the new information-based economy. A new theoretical base and proper tools are needed in order to provide digital businesses with (a) strategic and control information (b) future-orientated and historical information (c) financial and non-financial information (d) profit-motivated and socially-responsible information (e) timely and accurate information (Ratnatunga 2018).

Major issues that need attention include a widened accountability focus of accountants towards—customers, suppliers, employees, government and environmental groups, among others, consideration for the recognition and measurement of the extended capital of an enterprise such as "knowledge, innovation, communication, learning, and innovative abilities", contemplation about the timing requirements of information-era given that enterprises now require "real-time" information. Finally, accountants should reconsider all about information stability assumptions by continuous monitoring KPIs and tasks and visualizing reports and trends.

A long-term vision of the finance and accounting profession is generated in which the focus is shifted towards making IT advancements to support accountants' work to become more accurate in forecasting future trends and analyzing real-time digital data. Digitalization increases interconnectedness of customers, business, suppliers, and governmental agencies. As a result, competition becomes tougher, communication becomes faster and ideas are quickly turned into products which are easily copied by competitors (CGMA 2019) Organizations operate in conditions with financial and geopolitical instability, facing rising costs, supply chain and procurement problems, geopolitical instability and an energy crisis. Therefore, the challenges for the businesses are higher in a digital world, and employers turn to accountants and finance professionals to "help them stay afloat and navigate a future pathway to resilience" (IFAC 2022).

The accounting profession includes auditing, taxation, management accounting and control, forensic science and corporate reporting. Accounting is exercised in big and small practices, in the private and the public sector. None of these areas of accounting are left out of the evolutionary digital transformation (Narayan and Stittle 2018; Sorros et al. 2021). Several studies have examined how emerging technologies impact various aspects of accounting (Smith and Castonhuay 2020; Bakarich and O'Brien 2020; Curtis et al. 2009; Mahzan and Lymer 2014; Sutton et al. 2018; Kotb et al. 2019; Al-Htaybat et al. 2018).

Finance and accounting profession should create tighter collaborations and interaction with internal and external stakeholders across organizations and across functions. Digitalization affects management accountants and management control (MC) systems on different aspects. MC is designed to enable an organization to adapt to their environment and to keep organizations reliably on track (Fähndrich 2022). Digitalization has an impact on budgeting and reporting performed by management accountants which can be done more efficiently releasing time for more in-depth analysis of data, better managing risk and increasing the transparency of the activities of management accountants (Appelbaum, et al. 2017). The use of digital tools such as business intelligence, cloud computing, big data and automation allow management accountants to improve operational processes across multiple corporate functions (Fähndrich 2022; Rikhardsson and Yigitbasioglu 2018).

Smaller accountancy practices (SMPs) are influenced by technology also and they seem to have also embraced IT and social media as reported by IFAC (2023). The challenge for SMPs is that their clients do not want or are unable to support their decision for digitalization. The bigger the practice the more digitally advanced are, and the bigger the benefits in productivity, flexibility and overall attractiveness to new recruits and to existing and potential clients.

A recent research by CGMA (2019) revealed the following important points for finance and accounting professionals

- With regards to the time spent with the four basic finance activities, assembling information, analyzing for insights, advising to influence and applying for impact, respondents declared their wish to move towards the three last functions, therefore moving from isolation (accounting) to working in partnership with colleagues

across the organization (management). Digital tools allow finance functions to refocus towards insight, influence and impact.
- With regards to the awareness and use of digital tools, the results show a better picture than expected before the research took place, as it is shown in Table 1.

- Cloud computing, process robotics and visualization are categorized as core modernization tools while advanced analytics, cognitive computing and in-memory computing and Blockchain are categorized as exponential technology (Deloitte 2016). From core modernization tools, only cloud technologies have become a mainstream feature, while robotics is included in the "early adopters".
- With regards to the main tools and techniques used by finance professionals the most important cited by respondents have been data, value, costing and business model. All of them need re-evaluation and continuous updating of mastery by finance and accounting professionals in the digital world. Considering data, the focus instead of collection and processing, should be in ensuring the integrity and the proper communication given that it requires much deeper and further analysis than just reporting data.
- Costing systems have not changed dramatically, organizations continue to use activity-based costing (ABC) and management-based costing (ABM). Digital costing is just emerging as a concept but it needs further to be explored.
- Intangibles are becoming more important for organizations therefore measurement rules that ignore them should change. Hence finance professionals who can measure and report intangible value will be in high demand in the future.
- The finance function in the digital world is shaped by five levels. The lowest level concerns systems and technologies of recording. Next level includes technical specialists providing insights and interpretation in their respective areas. Next level consists of systems and technologies of engagement in order to influence and shape how the organization creates and preserves value and finally highest level is about systems and technologies of governance and oversight applying strategic leadership of the organization.

For assurance firms machine learning models and AI developments can complement human intelligence, supporting full data auditing rather a sample of it, enabling

Table 1 Awareness and use of technology (adapted from CGMA 2019)

Technology	Aware of technology (%)	Use of technology (%)
Cloud	91	54
Process robotics	50	11
Visualization	44	18
Advance analytics	68	25
Cognitive computing	33	5
In-memory computing	23	7
Blockchain	48	2

professionals to discover anomalies that may exist without using the resources typically required for traditional audit (Smith and Castonhuay 2020). The whole process will be faster and will take much less effort and will improve the accuracy of the accounting functions. Integrating AI and machine learning in high risk areas improves efficiency while permitting auditing and consultancy firms to regain time for establishing closer and better relationships with clients (Kwarbai and Omojoye 2021; Kokina and Davenport 2017).

Our relationship with technology is not a stable one. All finance and accounting stakeholders, need to continually re-invent this relationship as intelligent systems will undertake gradually more decision-making tasks from professionals. This phenomenon should not threaten the finance community as long as it engages in the optimization, diversification and transformation of the profession to better serve business and investment decisions (CGMA 2019; IFAC 2022; Deloitte 2023). However, this perspective of the finance function within the technology-based society requires new competences and a digital mindset of financial and accounting professionals. Higher Education Institutions have a high share of responsibility to prepare future accountants with digital competences to cope with the new digital world.

5 Educating Future Accountants

Globalization and technology developments have created a skills shortage in the finance and accounting professionals which was anticipated as early as the last quarter of twentieth century (Albrecht and Sack 2000; AECC 1990). Employers were blaming accounting academics for not preparing graduates properly and for the generic skills gap in their training. The market demanded a well-rounded education including hard and soft skills that would create competent professionals for a fast-changing business environment (Pincus et al. 2017; González et al. 2009). Since then many studies explored the range of skills required by the employers and the importance assigned to skills and competences (Roepen 2017; Asonitou 2015; Hassall et al. 2003). Digital skills were found to be highly appreciated by employers and academics in the required competences of accounting graduates. ERP systems became increasingly more and more important to employers moving from position 12 in importance to position 7 within ten years (Tan et al. 2004). Three major challenges were reported by Hood (2015) which preoccupied the profession (1) technology-induced changes that devalue core services of the profession, (2) finding new employees with the right mix of skills and retraining current employees who need new skills, and (3) keeping up with the pace of technology change.

Digitalization, the megatrend in the new era, apart from technical skills requires advanced analytical skills and business acumen from accountants so they can understand business operations, perform operational analysis, provide real-time reports and facilitate accounting decisions (Wang 2021). Therefore, a solid academic preparation is necessary and accounting curricula should be directed towards integrating these types of technology within studies.

Academia has started long ago to include digital skills and new technology into the accounting curricula however in different pace and speed in each country. Wang (2021) refers to an example of introducing data analytics program into the accounting curriculum and how rewarding it has been for the students. The study refers also to some major challenges such as time and talent requirement as this is a very demanding course compared to routine offered courses. Students need extensive practice to be able to perform an analysis, interpret the findings and provide recommendations.

Faculty considers the most important topic to include in a data analytic topic, is to develop student's data analytics mindset and give emphasis on data-driven critical thinking skills (Dzuranin et al. 2018). It is very important to develop students' ability to ask questions that can be answered using data and train them to effectively communicate process and outcome of data analytics processing.

The above challenges should be added to a number of barriers which have been explored already about skills introduction into the accounting curricula (Asonitou 2021; Arquero et al. 2022). Timing seems to be also a major challenge. Most HEIs are slow to adjust curricula to reflect changes in the IT environment and to integrate such analytical tools. It seems that there is a delay in HEIs responsiveness to adapt to changing conditions in comparison to the great acceleration of digital technology in the real world (Spraakman et al. 2015; Asonitou 2021).

Other researchers state that given the complexity of technology, no single stakeholder is sufficient to satisfy labor demands in digital skills. Accounting educators in HE are equally important as managers and employers in strengthening new accountants skills (Jackson et al. 2023). Projects and case studies are outlined as the most appropriate methods for delivering data analytics content to students.

6 Conclusions, Implications and Limitations

The aims of this study were to present the digital evolution of the accounting profession and the efforts of the accounting education to prepare well rounded future accountants.

Employers within this digital world require from accountants a range of skills including critical thinking, communication skills, agility, problem solving and well-developed ICT skills. Universities should develop accounting programs that have the proper balance of technical and generic skills to prepare future accountants to compete in a digital-oriented world.

Educators can achieve their goal by integrating various analytical tools and other advanced technology platforms for training of students. However other methods should also be followed such as: (a) promoting apprentices in business which have adopted and use such tools (b) promote synergies between different departments in HEIs, and promote also combined projects between students from different departments (c) promote synergies between HEIs and society for example with associations with related expertise (d) cooperate with organizations which can provide resources

to faculty to include in data analytics course (e) creation of hubs within universities which can attract talents and become knowledge resources for students.

Moreover, more collaboration initiatives between HEIs and enterprises will support an upgraded preparation of the next generation of accountants-advisors. In this way the accounting profession will be in place to serve the companies and face the challenges of the rapid pace of technological change.

This study offers an insight into the future of accounting education and the accounting profession in relation to the digital new world. This is not an exhaustive literature review but rather an interpretation of the current trends. A systematic literature review can offer a deep perspective on the issue under investigation.

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