

Chapter 1

The Impact of Artificial Intelligence on the Future of the Accounting Profession: A Literature Review

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Quote as: Hladika, M., Halar, P., and Kopun, D. (2024). The Impact of Artificial Intelligence on the Future of the Accounting Profession: A Literature Review. In J. Dyczkowska (Ed.), *Human versus Machine: Accounting, Auditing and Education in the Era of Artificial Intelligence* (pp. 15-34). Publishing House of Wrocław University of Economics and Business.

Contemporary era and companies' business environment are faced with the next (fourth and/or fifth) industrial revolution, whose main characteristics are socio-technologically driven innovations brought by technologies and concepts of value chain organisations (Barata and Kayser, 2023; Hermann et al., 2015). In other words, humans and machines are envisioned to work together in a virtual reality (ATOSS, n.d. b; Dai and Vasarhelyi, 2016). Terms like digital technologies, digitalisation, digital business transformation, cultural change, agility, and similar have become commonplace. Among all other primary and secondary digital technologies, artificial intelligence (AI) represents a breakthrough or a disruptor technology that

has the ability to surpass all other technological solutions and bring enormous enhancements to companies' business operations and their "front-" and "back-office" business functions. The digital transformation of businesses is the process of implementing technological solutions in all business processes in order for the company to remain competitive. Parallel to the digital transformation of businesses, a cultural change is taking place (Sabuncu, 2022). For the process of digital business transformation and digitalisation to be successful, the key lies in humans and their willingness to accept changes, learn and master new skills in order to fit into the digital environment as quickly and successfully as possible and perform their tasks efficiently. Accountants are a very important link in the whole process, as accounting is a core function of the company whose role is crucial to the company's success. Accordingly, changes in the business environment, the digitalisation of businesses and the implementation of digital technologies require accountants to acquire new knowledge, skills and abilities (Cordos and Tiron-Tudor, 2023a; Grosu et al., 2023; Kroon et al., 2021; Yigitbasiouglu et al., 2023). In a digitalised world, the success of accountants (and, accordingly, companies) depends on the effective combination of the use of appropriate technology and a set of right skills. As accountants face changes in their work, it is inevitable that they will need to expand and improve their knowledge, skills and abilities to meet the needs of their clients (Secinaro et al., 2021) and to remain relevant in this increasingly dynamic environment.

Therefore, this chapter seeks to provide answers to the following research questions:

- RQ1:** What are the key characteristics of companies' business environment in the era of the existing fourth and the upcoming fifth industrial revolution, driven by AI, and how do they affect currently, and will affect in the future, the overall accounting profession, accounting tasks performance and accountants' competencies?
- RQ2:** Which accounting tasks can and cannot be replaced by AI in the era of the fourth and fifth industrial revolutions?
- RQ3:** What are the key knowledge, skills and abilities of accountants needed for performing their tasks in the era of the fourth and fifth industrial revolutions?

These research questions lead to the following objectives of the chapter: (1) to identify the key characteristics of companies' business environment in the era of the fourth and fifth industrial revolutions and define their impact on the accounting profession, (2) to investigate which accounting tasks can and cannot be automated, and (3) to identify the new competencies of accountants required to successfully perform accounting tasks in the digital era.

In order to achieve the defined objectives of the research, the authors' desk searched relevant databases, primarily ProQuest, Scopus and Web of Science, Google Scholar search engine, as well as other publicly available secondary sources through the Google search engine to obtain relevant scientific and professional literature

that satisfied predefined criteria. These predefined criteria included the following keywords: "accounting and artificial intelligence", "accounting profession and artificial intelligence", "accountants' competencies and artificial intelligence". Therefore, the authors selected, for critical and comparative review, scientific and supportive professional literature that best suited the research topic and research objectives, for which full text was available in English. Selected literature was analysed by using scientific methods of analysis, synthesis, description, classification, and comparison.

In terms of structure, the chapter begins with section 1.1, which presents the state and perspectives of companies' business environment in the era of the fourth and fifth industrial revolutions driven by AI. This is followed by section 1.2, which analyses the impact of the use of AI on the accounting profession. Section 1.3 discusses accounting tasks that can be automated through the use of new digital technologies, primarily AI, whereas section 1.4 identifies areas in which AI will not be applied. This is followed by section 1.5, which provides a comprehensive insight into the competencies of accountants in the future. The whole chapter ends with concluding remarks, implications, and directions for future research on this emerging topic in the field of accounting, as well as with stating the limitations of the research.

1.1. Companies' Business Activities' Disruptions in the Environment of the Fourth and Fifth Industrial Revolutions

Currently, the corporate world is in the era of the fourth industrial revolution, which can be described as a disruption of companies' business activities performance and transformation of their overall business models, driven by digital technologies that allow creating greater added value in all parts of the value chain and for all involved parties, horizontally and vertically, by continuously exchanging information in a real-time. Originated in the industry and manufacturing, this next revolution has spread rapidly to all other economic sectors and professions and changed their traditional postulates and ways of working. Hermann et al. (2015, p. 11) define Industry 4.0 as an overall paradigm that gathers technologies and concepts of value chain organisations. Four key components of the fourth industrial revolution are cyber-physical systems, the Internet of things, the Internet of services and smart factory, while its core principles are interoperability, virtualisation, decentralisation, real-time capability, service orientation and modularity (Hermann et al., 2015). Digital technologies, as primary drivers and enablers of companies' digital business transformation, include, among others, mobile technologies, cloud computing, big data analytics, sensors, robots, drones, 3D printing, augmented and virtual reality, blockchain technology, nanotechnology, as well as AI. The main purpose of this current industrial revolution is to increase the value chain flexibility "by maximising the transparency of inbound and outbound logistics, manufacturing, marketing, and all other business functions such as accounting, legislation, human resource, etc." (Dai and Vasarhelyi, 2016, p. 1).

To achieve that, data need to be continuously interchanged (collected, transmitted and analysed) inside and outside a company in real-time to enhance decision-making processes, reduce costs, increase and make productivity gains, improve the effectiveness and efficiency of business operations, and capture strategic business value in the end (Dai and Vasarhelyi, 2016; Goering et al., 2018; Onyshchenko et al., 2022; Özcan and Akkaya, 2020). The results are radically transformed company's activities and the ways its business functions work, including accounting. The 'smart' or 'intelligent' company is envisioned, whose main feature is 'organisational agility', which can be defined as the ability to adapt quickly to changes so that the company can survive in a competitive environment by meeting customer demands and expectations promptly (Şen and İrge, 2020).

Furthermore, a new hot topic regarding industrial revolutions is the fifth industrial revolution or Industry 5.0. Regarding that, in both academia and practice, there exist two stances. The first stance is that the fifth industrial revolution is the next industrial revolution that will surpass Industry 4.0, while the second is that Industry 5.0 is just an evolution of the fourth industrial revolution. The agreement on what is more accurate is yet to be achieved. Nevertheless, Industry 5.0 can be defined as a "humanised vision of technological transformations in industry, balancing the current and future needs of the workers and society with the sustainable optimisation of energy consumption, materials processing, and product lifecycles" (Barata and Kayser, 2023, p. 778). According to Barata and Kayser (2023, p. 785), industry 4.0 is more technologically driven, while industry 5.0 is more socio-technically driven, but both are expected to continue their progress side-by-side, revolutionising corporate business. This is in accordance with the statement that Industry 4.0 integrates automation and data exchange in business activities, while Industry 5.0 enables collaboration between humans and machines (ATOSS, n.d. b). The strengths of Industry 4.0 will be even more emphasised by concepts of Industry 5.0 so that companies can be even more agile and future-ready (ATOSS, n.d. b). AI is an instrument that will strengthen the collaboration between humans and machines, with the mission of creating sustainable products and services (ATOSS, n.d. b). "In Industry 5.0, digitalisation is used to answer broader questions regarding environmental, energy, and social challenges. It is hence the integration of the technological determinants that shaped industry 4.0 into the larger context of humanity, spanning the boundaries of the factory floor" (Barata and Kayser, 2023, p. 784).

AI can be defined as "hardware and software that can learn, reason, adapt, analyse, make judgments, and execute complicated and judgment-based activities in the same way as the human brain can" (Hasan, 2022, p. 444). It is, therefore, a self-sustaining and evolving technology because "the more it does, the smarter it becomes, to the point where machines are now teaching other machines and learning on the job" (Hasan, 2022, p. 444). The subsets of AI are machine learning, robotic process automation, artificial neural networks and deep learning (Kommunuri, 2022, p. 585). The foundation of AI applications is machine learning models, and today exist three types of AI based on capabilities (IBM Data and AI Team, 2023):

- artificial narrow intelligence or weak AI, which can be trained to perform a single task much faster and better in comparison to a human mind,
- artificial general intelligence or strong AI, which can, based on previously gathered knowledge and skills, accomplish new tasks in different contexts without additional training,
- super AI or artificial superintelligence, for which it is envisioned that it will be able to think, learn, reason, make judgements and possess cognitive abilities surpassing those of human beings.

It is worth noting that, until now, artificial general intelligence and superintelligence are just theoretical concepts (IBM Data and AI Team, 2023). Artificial narrow intelligence can be divided into two categories based on functionalities (IBM Data and AI Team, 2023):

- reactive machine AI, like IBM Deep Blue and The Netflix Recommendation Engine
- limited memory AI, like generative AI, virtual assistants and chatbots, and self-driving cars.

Currently, one of the most popular among three AI types, artificial narrow intelligence's subcategory, generative AI, is related to helping people do their jobs better, so it is envisioned as their 'co-pilots' (Lamarre et al., 2024). The most popular examples of generative AI tools are OpenAI's ChatGPT, Google's Bard, Microsoft's and Nvidia's Megatron, etc. (ISACA, 2023, p. 4).

It is clear that AI will have a very important role in the corporate world in the near future, so companies need to familiarise themselves with the possibilities of this technology application (ATOSS, n.d. b). The adoption and usage of AI technologies in companies' business activities increase effectiveness, efficiency, accuracy, and decision-making capabilities, resulting in improved financial and non-financial reporting (Abdullah and Almaqtari, 2024).

Therefore, the adoption and usage of AI in companies' business activities need to be carefully planned, and proactive and holistic strategies with clear objectives, risk management processes, and internal controls must be developed. Efforts to implement and use AI in companies' business activities should not come at the expense of risk management (ISACA, 2023, p. 4). There are many uncertainties and unknowns regarding this technology, but governance structures need to start preparing and adapting to AI revolutionising their business activities now, as they need to be aware that this technology is already being used within their companies in some form (ISACA, 2023, p. 5), even indirectly and unintentionally. A company's competitive advantage in the modern age "comes from building organisational and technological capabilities to broadly innovate, deploy, and improve solutions at scale – in effect, rewiring the business for distributed digital and artificial intelligence innovation" (Lamarre et al., 2024). Despite unimaginable usefulness and opportunities brought by Industry 4.0 and 5.0 concepts, including the AI revolution, there are also

lots of downsides, primarily in terms of increased cybersecurity, legal issues, ethical issues and all other types of known and unknown risks, as well as the fact that some professions are starting to disappear as certain tasks and jobs are being replaced by innovative technologies. On the other hand, new tasks and jobs are also being developed, such as those related to programming and robot maintenance (ATOSS, n.d. a). There is also a need to develop and adjust governance systems and regulatory requirements related to AI (ISACA, 2023, p. 3).

1.2. Accounting Profession's Disruptions in the Era of Artificial Intelligence

Foundations and principles of Industry 4.0 transformed accounting functions' ways of working and enabled the creation of a mirror (or a virtual) world, which was accelerated in the period of the COVID-19 pandemic (Halar et al., 2023, p. 123). Industry 5.0 will also have a deep transformational influence on the overall accounting profession and accounting functions in companies.

Companies are gaining value by implementing advanced technologies, including AI, into their general and administrative support functions (Edlich et al., 2018). Automation and AI can drastically reshape accounting functions in companies (Plaschke et al., 2018). Automating routine accounting tasks through tech- and especially AI-enabled transformations will deliver substantial impacts for the whole company (Edlich et al., 2018). Some analyses show that around one-third of accounting and finance tasks and activities, like general accounting operations, revenue management, cash disbursement, external reporting, treasury, tax, and the like, can be automated using already available technologies, while other two-thirds require advanced cognitive automation technologies (Edlich et al., 2018; Kommunuri, 2022; Plaschke et al., 2018). Basic technologies include robotic process automation or 'software robotics', business-process management and optical character-recognition tools, among others, while more advanced technologies, for example, are machine-learning algorithms and natural-language tools (Kommunuri, 2022; Plaschke et al., 2018). In the modern era, these basic technologies are mainstream, meaning they are mature and easy to adopt and use in accounting, while advanced ones are not mainstream, as they are still in developing phases but available for implementation and usage in accounting (Plaschke et al., 2018). To capture the full potential of basic and advanced technologies for transforming accounting functions, managers must re-engineer their processes completely (Kommunuri, 2022). AI has wide usability and applicability opportunities in accounting functions. This means that, for example (Plaschke et al., 2018):

- robotic process automation can automate tasks of preparing journal entries,
- machine learning can automate tasks related to reconciling accounting records,
- natural language tools can be used to produce report commentary.

In contrast to offshoring, outsourcing and centralisation as drivers of accounting and finance functions' productivity improvements for decades, in the new industrial revolution and AI era, automation is a new enabler of effectiveness and efficiency gains (Plaschke et al., 2018). To be able to record business transactions without the help of accountants, companies need to invest heavily in their technological infrastructure to adapt it to the requirements of the fourth industrial revolution and become smart (Onyshchenko et al., 2022, p. 173). In the contemporary fourth and rapidly approaching fifth industrial revolution, the discrepancy between an event occurring, its recording and informing about it for decision-making purposes should be minimal, meaning that it should be in real-time. Therefore, terms like continuous accounting, real-time accounting, accounting 4.0, accounting 5.0, etc., have brought wide attention. To cope with disruption challenges in the modern age of AI, digitalisation, and digital transformation, the accounting and financial functions of a company need to plan it strategically and holistically by including people, data, processes and technologies. By automating and transforming their ways of working, scarce resources are saved. Adoption of AI in accounting can increase the accuracy and transparency of financial and non-financial reporting, reduce costs, and improve efficiency and outcomes (Kommunuri, 2022; Wael et al., 2024). On the contrary, AI implementation requires significant infrastructure, software and training investments, high computing power and significant storage capacity (Wael et al., 2024, pp. 5-6). Therefore, a cost-benefit analysis needs to be done to make the right decision regarding the implementation of AI in accounting practices.

In parallel to Industry 4.0, Industry 5.0, AI and other digital technologies, the notion of corporate sustainability or environmental, social and governance (ESG) questions have come to the fore (Burritt and Christ, 2016; Onyshchenko et al., 2022). It is not accidentally, as the fourth industrial revolution has possibilities to improve (Burritt and Christ, 2016, pp. 29-30):

- external environmental accounting: better data quality, reduced opportunities for greenwash and brownwash, less management discretion over measuring and reporting objects, higher credibility of data,
- environmental management accounting: obtainment of previously unobtainable data, raising the quality of data for (environmental) decision-making purposes, better management control, quality data pool for various purposes and stakeholders, piggybacking onto existing manufacturing infrastructure for minimising investment costs.

Digitalisation and transformation of companies in different industries will have impacts on the accounting profession in terms of defining relevant accounting rules and policies for recognition, measurement and disclosure of information about innovative digital technologies as intangible assets (Onyshchenko et al., 2022, p. 173). Therefore, regulators need to incorporate technological changes when adjusting or formulating new accounting rules, policies or standards (Hasan, 2022).

Regarding the predictions that some professions and jobs will disappear, including accounting (Rawashdeh, 2023), Onyshchenko et al. (2022, p. 189) state that the roles of accountants will change but that technologies will not substitute accountants. According to Hasan (2022, p. 462), accounting professionals cannot be replaced by AI when tasks that need human creativity and judgments are in question. This is in accordance with Leitner-Hanetseder et al. (2021), who concluded that some non-core tasks and skills of accountants will be changed and replaced by AI and other digital technologies, while core accounting roles and tasks will continue to exist, even though they might be performed using digital technologies or in collaborating with them. On the contrary, AI will complement accountants' performance, as they can re-engineer the whole record-to-report process by automating repetitive and time-consuming tasks (Kommunuri, 2022, p. 588).

This requires a drastic shift in educational curriculums of academia, professional bodies continuing professional development programs, and training processes (Hasan, 2022). Accountants will transform from basic clerks and data operators to strategic leaders, trusted value advisers, dynamic thinkers and *storytellers* (Halar et al., 2023, pp. 123-124). Accountants have a critical role in ensuring that the usage of AI aligns with organisational values and that immoral decision-making is avoided (Abdullah and Almaqtari, 2024, p. 13).

1.3. Areas of Application of Artificial Intelligence by Accounting Functions

Over the past decade, numerous studies have pointed out that the accounting profession is highly susceptible to automation (World Economic Forum, 2020). This is nothing new – in the 1970s, some pioneering work on AI identified tax accounting as fertile ground for development work, while in the 1980s, spreadsheet software and micro-computers (as they were then called) were enthusiastically embraced by most leading accounting firms (Susskind and Susskind, 2016, pp. 103-104).

In the past, the accounting profession was directly influenced by the development of information technology. In particular, the introduction of Enterprise Resource Planning (further in text: ERP) software has driven the automation of accounting functions in many medium and large companies. This automation manifests itself primarily in the establishment of predefined accounting schemes for repetitive transactions such as outgoing invoices, routine incoming invoices and the recording of bank transactions. This automation results from processes that are well-established in the existing literature and do not fall under the classification of AI.

The ultimate goal of using AI in day-to-day business should be to increase productivity and automate routine tasks. As already mentioned, AI encompasses a broad spectrum of concepts, methods and technologies. From the perspective of the accounting profession, it is imperative to recognise the importance of not only AI

but also blockchain technology and robotic process automation (further in text: RPA) as key technological advances.

As the main functions of accounting include tracking, reporting, executing and predicting financial transactions, the following tasks are likely to be influenced in the future by advances in AI, blockchain technology and RPA.

Function 1: Tracking

Tracking financial transactions is an important but time-consuming component of the accounting process. Despite the acceleration provided by ERP systems, further improvements are possible through the use of innovative technologies such as:

- Integration of AI in ERP systems, especially in the processing of incoming invoices. AI algorithms trained using optical character recognition software on a dataset of scanned invoices and the corresponding postings can be used to automate current period postings.
- Blockchain for more transparency: Blockchain technology introduces a paradigm shift in tracking by enabling the exchange of accounting information between transaction parties (e.g. seller and buyer) in real-time. Blockchain could help accountants gain clarity on their companies' available resources and commitments and also free up resources to focus on planning and valuation rather than recordkeeping (ICAEW, 2018a). This will lead to a shared ledger that can be viewed within networks of companies using a triple-entry ledger based on blockchain technology (Han et al., 2023).
- RPA for repetitive tasks – RPA technology is able to automate structured, rule-based tasks, such as:
 - Copying and pasting documents (e.g. incoming invoices and bank statements) from external sources into the ERP system. Once the documents have been downloaded into the system, other technologies take over further tracking tasks in the system.
 - Filling out online forms, such as the registration of employment relationships with institutions (tax office, pension insurance, etc.) based on the information already recorded by the payroll department.

Function 2: Reporting

The preparation of financial statements and internal reports after the recording of transactions is an important task of accounting departments. This function includes both external and internal reporting.

- External reporting: Automation has already significantly improved efficiency in the preparation of the primary financial statements (statement of financial position, income statement, cash flow statement and statement of changes in equity). However, the automation of the notes to the financial statements is an

area that is ready for further development. Utilising data from ERP systems can streamline the preparation of notes and thus improve the scope and accuracy of financial reports.

- Internal reporting: The need for diverse reporting across different business functions has traditionally required a decentralised approach, often managed by controlling departments. Advances in the skills and knowledge of accounting professionals in the area of data processing provide the opportunity to outsource internal reporting within the accounting function.

Function 3: Executing

The execution function includes tax compliance, payroll administration and financial tasks (i.e. payments) in addition to tracking and reporting (as explained earlier). As an integral part of accounting, tax compliance is one of the most important functions – in an increasingly transparent and legally complicated environment, organisations need to clarify their tax risk management framework with third parties such as regulators, tax authorities, new business providers and service providers (Dwianika et al., 2023).

Function 4: Predicting

With access to historical data, accounting helps predict future financial trends, focuses on budgeting and risk assessment, and helps with strategic planning. With the help of AI, historical financial data can provide insights and forecasts. AI's ability to analyse vast amounts of data outperforms traditional manual analysis in terms of both speed and volume, enabling more nuanced and predictive insights.

Kokina and Davenport (2017) emphasise that the need for human accountants will not disappear in the foreseeable future, but there are certain activities that can already be automated. Table 1.1 shows a systematic overview of the accounting areas and activities that can be automated.

Table 1.1. Areas and activities that can be automated in the accounting function

Area	Activities
1	2
Accounting	<ul style="list-style-type: none"> ■ Automating complex journal entries ■ Performing and documenting accounts reconciliations ■ Calculating and applying allocations ■ Maintaining fixed-asset accounts
Accounts payable	<ul style="list-style-type: none"> ■ Entering nonelectronic-data-interchange invoices ■ Performing 2- and/or 3-way invoice matches ■ Processing expense-approval requests ■ Completing audits (e.g. duplicate supplier payments)
Accounts receivable	<ul style="list-style-type: none"> ■ Generating and validating invoices ■ Applying cash to outstanding balances ■ Analysing and processing disputes ■ Creating reports (e.g. accounts-receivable ageing, credit holds)

1	2
Financial planning and analysis	<ul style="list-style-type: none"> ■ Building standard management reports ■ Consolidating and validating budget and forecast inputs ■ Gathering and clearing data for analysis
Payroll	<ul style="list-style-type: none"> ■ Flagging time-sheet errors and omissions ■ Auditing reported hours against the schedule ■ Calculating deductions ■ Harmonising data across multiple timekeeping systems
Other	<ul style="list-style-type: none"> ■ Preparing external-reporting templates ■ Conducting transaction audits of high-risk areas ■ Preparing wire-transfer requests

Source: authors according to (Plaschke et al., 2018).

Finally, a significant impact of digital technologies can be in the area of incorporating big data from accounting with other data such as free text, images and videos that can be analysed and manipulated (Kroon et al., 2021) to obtain better information and predictions about future trends.

1.4. Areas in Which Artificial Intelligence Will Not Be Used

As can be seen from the previous description of potential tasks that can be automated in accounting, all of these processes must be controlled and managed by people – professional accountants – regardless of the potential of AI, blockchain and RPA in accounting. This is especially true for non-routine accounting tasks as well as for tasks that appear in accounting for the first time (i.e. new business transactions).

Due to the limitations of these earlier forms of AI, non-routine tasks that were difficult to codify seemed to be protected from automation, especially as earlier waves of technology had automated mainly less skilled occupations. The release of ChatGPT in November 2022 changed both the nature and urgency of the discussion. Large language models proved unexpectedly capable in creative, analytical and written tasks and even achieved top scores on university and professional exams (Dell'Acqua et al., 2023). Despite the hype around large language models, only 29 papers on large language models in accounting were published on SSRN in the period from the beginning of 2022 to the end of October 2023 (Dong et al., 2023). This suggests that the use of large language models in accounting is still in its infancy. The future tasks and roles in accounting that will be influenced by large language models are, therefore, still difficult to predict.

Finally, through automation and AI, blockchain and RPA implementation, accounting departments will have the opportunity to either:

- expand their role in finance and financial planning and analysis due to the additional time freed up by automation and AI implementation. This will result in accounting professionals taking on more “generalist roles” compared to their current roles or

- expand their role in data-driven functions, which will lead to a consultative style of accounting that will enable some strategic moves to be proposed to senior management. This new role is described by ACCA as a “data navigator”, one of the 5 “career zones” available in accounting (ACCA, 2020a).

1.5. The Competencies of Accountants for The Future

Over the course of their careers, professional accountants use a variety of skills to perform their highly specialised tasks. However, the landscape of accounting and the careers of accountants have changed dramatically over the past decade. “Traditional” competencies of accountants, which include knowledge of accounting standards, accounting regulation and tax laws, and related skills and abilities, are no longer sufficient to successfully perform accounting tasks in the modern business environment. The digitalisation of business and the application of digital technologies in the execution of tasks have had a profound impact on the accounting profession. As a result, professional accountants are now required to have broadened knowledge, skills and abilities (further in text: KSAs) or, in a word, competencies in order to improve the quality of their services and fit into the modern business environment.

As organisations adopt new digital technologies into their business, accountants must learn to use them to stay relevant and competitive. Many authors (Chabus, 2021; Cordos and Tiron-Tudor, 2023b; Gonçalves et al., 2022; Luhova, 2023; Rumbens et al., 2019; Tavares et al., 2023) have highlighted that in the age of digitalisation and the increased use of digital technologies such as blockchain technology and AI, professional accountants are expected to develop new skills such as interpersonal skills, attention to detail, time management, leadership, critical thinking, problem-solving, communication, collaboration and propensity for teamwork.

According to UNESCO (2018), digital skills are defined as “a range of abilities to use digital devices, communication applications and networks to access and manage information.” Mastering the digital skills of accountants in a changing world is a continuous process (ACCA, 2020b, p. 45). Digital skills are crucial for the efficient use of new tools and technologies and for keeping up with the latest trends in an ever-changing business world. Digital literacy is important for gaining a better insight into the company’s overall operations and consequently making informed business decisions. The use of powerful analytics tools (e.g. Microsoft Power BI, Sage Intelligence or SAP Analytics Cloud) enables the identification of trends and patterns in financial data and is also useful for analysing key performance indicators. ICAEW (2018b) points out that the digital skills of accountants help maximise the business benefits from the use of technological innovation in the following areas: automation, anticipation of risks and opportunities and advisory services.

Given the changes brought about by the application of digital technologies and the digital transformation of business, it is clear that traditional business strategies

and models are being disrupted, and accountants have the potential to become ‘in-house management consultants’ in the future (IFAC, 2019). The traditional role of the accountant as a provider of information is changing, and the accountant of the future is becoming a data scientist who has developed strong business analytics skills (Oesterreich and Teuteberg, 2019). Analytical skills of an accountant are the ability to gather information to identify the problem, then through detailed analysis of that information, find out the relevant facts and offer the best solution to the problem. These skills help accountants assess and evaluate data in order to make operational and strategic business decisions that increase the company’s success.

Al-Htaybat and von Alberti-Alhtaybat (2017) highlight similar skills that accountants for the future will have to develop: analytical skills, communication skills (telling a story) and creative and open mind (creativity). Effective communication (written and verbal) is paramount for accounting professionals. They should be able to listen, present ideas in a clear and concise way, present complex financial information clearly and concisely and adapt their communication style to different audiences. Accountants collaborate with almost all departments within the organisation (e.g., in creating business strategies, budgets, and cash flow projections), so good collaboration with other employees is of utmost importance to them. Time management is crucial for accountants, as many accounting tasks have to be completed within a strictly defined deadline.

When analysing the relevant literature, a large number of different skills were identified that are required of accountants in the digital age. In order to gain a better overview, it is necessary to group them. Tsiligiris and Bowyer (2021) list four categories of skills required for the accountants of the future, namely: (1) *ethical skills*, (2) *digital skills*, (3) *business skills* and (4) *soft skills*. Within each of these key categories of skills for future accountants, subcategories of specific skills are listed in Table 1.2.

Table 1.2. Categories and subcategories of skills identified as important for future accountants

Category of skills	Subcategories of skills
Ethical skills	<ul style="list-style-type: none"> ■ technical ethical skills ■ interpersonal ethical skills
Digital skills	<ul style="list-style-type: none"> ■ basic digital skills ■ advanced digital skills ■ data skills
Business skills	<ul style="list-style-type: none"> ■ consulting and business advisory skills ■ strategic thinking
Soft skills	<ul style="list-style-type: none"> ■ adaptability ■ communication ■ lifelong approach to continuous personal and professional development ■ critical thinking ■ dynamic problem-solving ■ emotional intelligence

Source: (Tsiligiris and Bowyer 2021, p. 631).

In the course of their work, accountants have access to very sensitive company financial data as well as personal data. Under these circumstances, individuals could misuse or manipulate this data. In addition, the use of new digital technologies related to advanced big data analytics has led to ethical challenges for the accounting profession (Tsiligiris and Bowyer, 2021). For this reason, accountants must adhere to strong ethical standards in the fulfilment of their daily duties. Tsiligiris and Bowyer (2021, p. 632) pointed out that future accountants should have “a set of ethical skills that can be summarised in two broad dimensions: (1) technical and (2) interpersonal ethical skills”. Technical ethical skills include “knowledge of the ethical guidelines and code of conduct of accounting professional bodies”, while interpersonal ethical skills include asking the right questions to maintain the quality of data generated and used by digital technology (Tsiligiris and Bowyer, 2021, p. 632).

According to Tsiligiris and Bowyer (2021), digital skills for future accountants comprise:

- basic digital skills related to the use of key digital technologies such as ERP systems, standard business intelligence applications, cloud-based accounting solutions, digitisation of tax return activities, etc.
- advanced digital skills mean that accountants are familiar with newer and more advanced digital technologies such as AI, blockchain technology, advanced business intelligence, programming, etc.
- data skills incorporate data management skills (e.g. accuracy, relevance, consistency) and data analysis.

The range of technical skills of accountants should be extended by basic digital skills (Dow et al., 2021), advanced digital skills (Yigitbasioglu et al., 2023) and data skills. Huerta and Jensen (2017, p. 102) emphasise that “extracting meaningful knowledge from big data requires not only a deep understanding of the data but also a creative way of thinking about data. The challenge with big data is identifying the right questions to ask.”

The role of accountants is changing with digital innovations, so the tasks of accounting are shifting from routine tasks to value-adding activities for organisations (Andreassen, 2020). Accountants need the KSAs to meet the need for timely and accurate data and to present it in understandable, non-technical language. According to Tsiligiris and Bowyer (2021), two sets of business skills have emerged as critical for future accountants: consulting and business advisory skills and strategic thinking. In the future, accountants are expected to be directly involved in the decision-making process, so strategic thinking will become increasingly important (Halar et al., 2023, p. 121). Strategic thinking means being able to see the bigger picture, and strategic direction sets the direction in which the organisation is heading in the long term.

Many authors and reports emphasise the increasing importance of accountants’ soft skills. Soft KSAs include interpersonal and communication skills, including the ability to fit in and adapt to the company’s organisational culture (Halar et al.,

2023, p. 121). Among the soft skills of accountants, adaptability, critical thinking, dynamic problem solving, lifelong approach to continuous personal and professional development, and emotional intelligence stand out (Tsiligiris and Bowyer, 2021):

- adaptability – accountants need to be adaptable to the changing business environment and challenges emerging from the digital transformation of businesses and changes in business models
- communication – accountants act as a link between internal and external stakeholders and need to use effective ‘storytelling’ to present complex and diverse data in a non-technical and engaging way
- lifelong approach to continuous personal and professional development – accountants need to take the initiative to keep learning (reskilling and upskilling) in order to meet the changing needs of the labour market
- critical thinking – one of the most important skills of accountants in the future
- dynamic problem-solving – in the digital context, accountants need to be able to make decisions under uncertainty and taking into account a dynamic set of factors
- emotional intelligence – the accountant’s ability to recognise, regulate and manage their own emotions and those of others and to harness and apply them to tasks.

The use of advanced digital technologies in business is important not only for the accounting profession but also for universities, study programs, and students. In this environment characterised by accelerated digitalisation and the use of digital technologies, there is a need to change the current accounting curricula in universities to provide students with the necessary technical but also soft skills for a successful career in accounting in order to shape the future (Damerji and Salimi, 2021; Surianti, 2020) and adapt to the new reality as efficiently as possible (Ellitan and Anatan, 2020). Jackson et al. (2023) and Tsiligiris and Bowyer (2021) emphasise the need for extensive and relevant collaboration between employers, professional bodies and associations, and universities to provide accounting education that meets the needs of the market in terms of KSAs of accountants for future. Universities and other educational institutions need to update accounting study programs to prepare students for their new roles and future careers. The focus of changes in study programs should be on the development of critical and systemic thinking and the development of students’ creative skills (Gulin et al., 2019).

1.6. Conclusions

The corporate business environment in the contemporary AI era is faced with different disruptions for different industries and companies, as well as for their core operational and support infrastructural business functions. For companies

to be successful, it is important to strategically and holistically plan the overall transformation of every function and operation in a company. The overall accounting profession is deeply impacted by Industry 4.0 and Industry 5.0 conditions, principles and components, including particularly AI and its humanised view of technological changes. As companies plan to adopt and implement AI and other digital technologies in their day-to-day core business operations, governance structures also need to holistically plan the overall transformation of companies' support business functions, including accounting. The accounting function is 'a heart and a blood flow' of every company, as financial and other information from all other functions are gathered or 'flow' into the accounting information system, where information is analysed and prepared in the form of financial and non-financial statements and then 'flow' out for decision-making process of various internal and external stakeholders. Therefore, to be able to operate properly, accounting functions and accountants also need to adapt and transform to add value to governance structures in the AI era.

The perceptions, roles and competencies of accountants, as well as perceptions and tasks of accounting functions in companies, are radically transformed. Digital technologies, including AI, will become a standard toolkit for future accountants – dynamic and strategic value advisers of companies' governance structures. Their competencies set will be drastically changed, so education curriculums and continuing professional development programs also need to be revised and adapted for the accounting tasks in the next industrial revolution. Repetitive and time-consuming accounting tasks will be automated by AI technologies that will increase the effectiveness and efficiency of the accounting function. Furthermore, to be relevant in the contemporary era, the accounting profession needs to adjust or write completely new accounting rules, policies and standards for the next industrial revolution driven by AI and human-technology interaction.

The rapid advancement of technologies such as AI, blockchain and RPA heralds a transformative era for the accounting profession. They promise to automate routine tasks and free up accountants to focus on strategic advisory tasks. Despite these advances, professional accountants remain indispensable to managing complex, novel transactions and ensuring ethical and regulatory compliance.

The future of accounting is likely to lie in financial planning and analysis as well as data-driven advice, emphasising the growing importance of multi-faceted and advisory roles in the age of technology. This shift emphasises not only the need for accountants to constantly learn and adapt but also the critical role they play in interpreting complex data to ensure the transparency, accuracy and reliability of financial reporting.

Traditionally, accountants have a strong technical background. The dynamic business environment and the increasing use of digital technologies in business require accountants to complement their technical skills with numerous other skills in order to survive and be relevant in these circumstances. When complemented with the right combination of ethical, digital, business and soft skills, accountants are in

a unique position to add value to organisations and their stakeholders. Advanced KSAs of accountants can help organisations in various areas – identify cost savings for better efficiency, reduce operating costs, minimise risks, optimise business decisions and business performance, increase profits and revenue streams, and identify patterns and trends. In conclusion, it can be said that the use of digital technologies in business has changed the role and tasks of accountants in business processes.

This chapter debates a comparative review of the literature and a critical examination of the state and perspectives of accountants in organisations, the competencies of accountants and the way accounting tasks are performed in the era of the fourth and fifth industrial revolutions, primarily disrupted by AI. Presented results can be useful for professional bodies, regulators, and educational institutions dealing with the accounting and accounting profession. With the aim of closing the gap between theoretical and applied research, further research should focus on exploring the market situation to find out how to manage organisational change in the era of smart digital technology adoption. It is necessary to examine the overall competencies of current accountants, the degree to which they use digital technologies to perform their tasks and the importance of accountants in adding value to the organisation in the digital age.

The research in this chapter is not without limitations. Firstly, in the era of big data, our analysis is not comprehensive, as we did not manage to analyse all published literature on the research topic in all relevant databases, so additional bibliometric and systematic methodological approaches to the research are welcomed. Secondly, we analysed secondary literature and gained insights from this type of literature, but primary research would also enrich the research field. Furthermore, additional and broader themes could be studied in more detail, including the advantages and disadvantages of AI impacts on the accounting profession.

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