

Professional Skills of Future Accountants Working in a Digitized Environment Dominated by ERP Systems or Artificial Intelligence

Laura – Eugenia – Lavinia BARNA*

Bucharest University of Economic Studies, Bucharest, Romania

**Corresponding author, laura.barna@cig.ase.ro*

Bogdan – Ștefan IONESCU

Bucharest University of Economic Studies, Bucharest, Romania

bogdan.ionescu@cig.ase.ro

Corina – Cătălina HURDUCACI (GOREA)

Bucharest University of Economic Studies, Bucharest, Romania

hurducacigoreacorina22@stud.ase.ro

Abstract. *The massive evolution of the digitization concept in recent years has also gained momentum among accounting professionals, as a result of the massive use of IT systems called ERP (Enterprise Resource Planning) systems. Thus, their entire activity is focused on the processing of financial-accounting data with the help of ERP (Enterprise Resource Planning) systems. The modular structure of ERP (Enterprise Resource Planning) systems can be integrated for other departments within an organization, but in this article the financial-accounting module of the ERP (Enterprise Resource Planning) system will be discussed, in order to identify the main skills of future accountants. Artificial Intelligence, and learning algorithms in particular, offer exciting opportunities to help professionals such as accountants improve their skills, the way they deliver services and the way they create value.*

The research method used for this article is quantitative, based on the bibliometric analysis of the digitization of the accounting profession, focusing primarily on what skills future accountants should develop. The sample of articles used for the analysis was selected from the Web of Science platform, then to be analyzed using the VOS viewer application. The results obtained indicate a significant increase in the analysis capacity of the future accountants, greatly reducing the part of manual data processing that they did manually in the past.

The conclusion of the article demonstrates how much the activities of professional accountants have evolved as a result of the digitization of their activities, using ERP (Enterprise Resource Planning) systems or Artificial Intelligence.

Keywords: ERP systems, Artificial Intelligence, future accountants, skills, digital, modular structure, quantitative

Introduction

The digitization concept has started to gain momentum in recent years, this offering many facilities to both employees and organizations as a result of the efficiency of the activity. Everything is possible with the help of ERP systems that aim to integrate the entire activity of the organization due to the modular structure that this system has. Thus, all transactions processed with these systems are stored at the level of the system's database (Belfo and Trigo, 2013; Andreassen, 2020). The data processed with these systems are presented in the form of reports that will be the basis for substantiating the decisions adopted by the management.

But once with digitization, the role of employees, especially those who work in the accounting field, changes, they have less and less to process information manually, they focus more on consulting (Lehner et al., 2019).

The main objective of this article is to track what skills future accountants should develop as a result of the massive digitization of the last period.

Coman et al. (2022) states that *“digitization of accounting is providing to be not only a modern solution, imposed by technological progress, but also timely, necessary, and even mandatory given the difficulty of anticipating the economic and social context due to the pandemic crisis”*. Friday and Japhet (2020), believes that ERP system helps accountants to prepare financial statements much easier.

ERP (Enterprise Resource Planning) is an integrated management system of the core business processes, usually facilitated by software and technology. AI (Artificial Intelligence), on the other hand, pertains to the simulation of human intelligence processes by machines, particularly computer systems (Hassan, 2022). The integration of AI into ERP systems can revolutionize the way enterprises manage their operations, offering advanced automation, predictive analytics, and increased efficiency.

This synergy promises to open new horizons for innovation and optimization in resource management (Kerzel, 2021).

The purpose of digital transformations is to *“redefined the industrial structures and reinvented business models”* (Goncalves et al., 2022; Gulin et al., 2019).

The article is structured as follows: a section that describes the problem to be analyzed at the level of the article, a section that contains the research questions, a section that describes the research method, a section that contains the main results obtained and a section that describes the conclusion of the article.

Literature review

Al-Htaybat et al. (2018), consider that *“global digital revolution has irrevocably transformed societies and industries”*. According to Andreassen (2020), *“digital technology has become a topic of considerable interest”*. Digital transformation has changed the accounting profession in obtaining and processing data to produce information for organizational decision making (Suarda et al., 2021).

Numerous studies have indicated that the repetitive tasks of accounting professionals were transferable to new technologies (ERP systems). Other theories state that ERP systems can provide the opportunity to centralize data and decisions more easily.

A study carried out by CIMA (Belfo and Trigo, 2013) showed that the responsibilities of accountants have changed as a result of the massive digitization of the last period, moving from traditional accounting operations (performed manually) to digital operations, guidance and support of strategic management.

Guş and Mangiuc (2022, cited by Coman et al., 2022), believe that digitization will contribute to a reorganization of the way accounting professionals communicate in the business environment. Continuing education and the use of new technologies, such as ERP systems, Artificial Intelligence or Machine Learning, causes accounting professionals to acquire new knowledge in the field of technology so that they can improve their work at the job.

Artificial Intelligence (AI) (Coman et al., 2022), is defined as a generic concept that refers *“to systems that copy human intelligence to perform various activities in work processes and than*

can be continuously improved based on the information they gather in each work stage”. Artificial Intelligence has three areas of actions presented in figure 1.

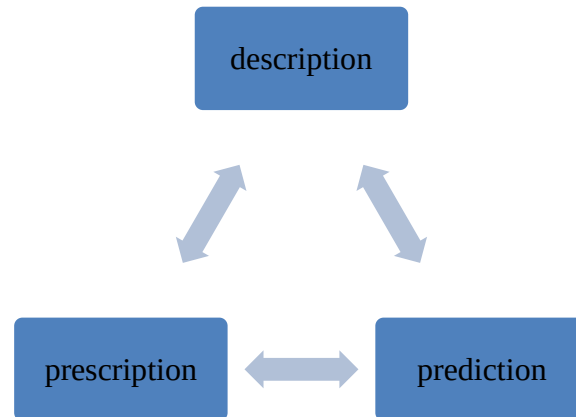


Figure 1. Three areas of actions in AI

Source: Author's own creation based on Coman et al., 2022.

Description represent knowledge or understanding of the research data (*what happened*). The purpose of the prediction is to use of historical information to decipher the future (*what will happen*). The purpose of prescriptions is to get the best results (*what needs to happen*). These concepts can be observed in figure 2.

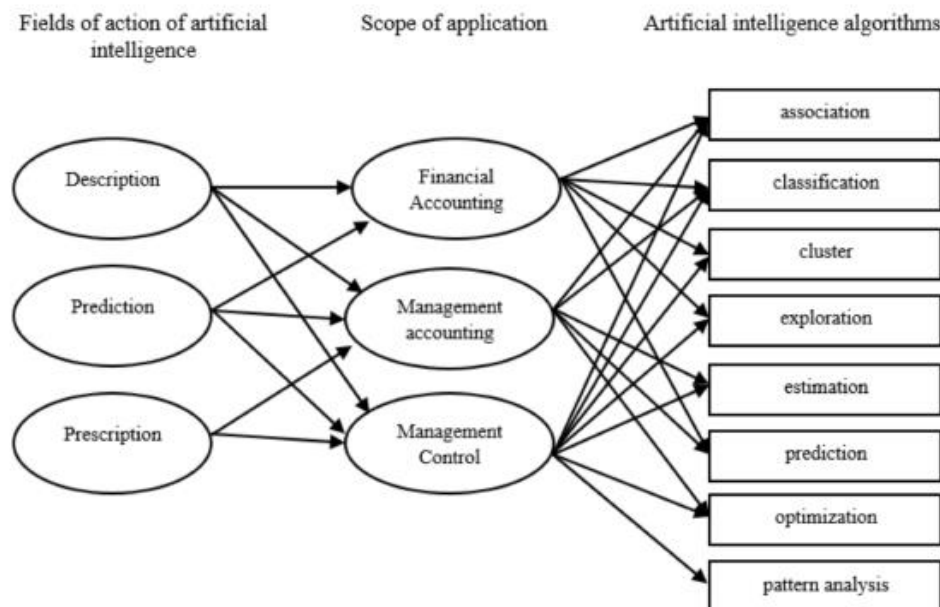


Figure 2. Fields of action, scope, and specific AI algorithms

Source: Coman et al., 2022.

The problem addressed in the article boils down to identifying the skills that will be developed by accounting professionals in the future as a result of the evolution of the digitalization phenomenon.

In practice, accounting professionals have the role of ensuring *"preparation and presentation financial statements or auditing already prepared financial statements to ensure that they reflect a true and fair view of economic reality being measured and reported"*.

The World Economic Forum (cited by Goncalves et al., 2022) identified ten skills necessary for accounting professionals in the new digital era, these being presented in table 1.

Table 1. Skills necessary for accounting professionals in the new digital era

Today	Trending	Declining
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problem-solving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Source: Goncalves et al., 2022.

The necessary current and future skills for accounting professionals are presented in table 2 below:

Table 2. The necessary current and future skills for accounting professionals

Technical Skills/Hard Skills		Social Skills	
Understanding the capabilities of the software	Basics of coding	Strong communication	Emotional intelligence ethical
Analysis skills	Fintech software knowledge	Conflict solving	Adaptability, tolerant of uncertainty
Data visualisation	Data security, forensic tools	Leadership skills	Sales knowledge
Knowledge of International Standard	Data warehouse management	Risk management	Innovative/Creative
Knowledge of industry-specific regulations	Enterprise resource planning (ERP) experience	Strategic decision making	Customer service orientation

Source: Goncalves et al., 2022.

Munoko et al. (2020), consider that accounting companies are *"reporting the use of artificial intelligence in their auditing and advisory functions, citing benefits such as time savings,*

faster data analytics, increased levels of accuracy, more in-depth insight into business processes and enhanced client service”.

According to Arntz et al. (2017, cited by Gulin et al., 2019), “*many accounting tasks already are automated in many companies (especially in large companies)*”, and they are represented by “*invoicing, payroll and bookkeeping and they are automated because they consist of routine, repeated, stable and structured actions*” (Gulin et al., 2019).

Companies that use ERP systems or Artificial Intelligence, gain four advantages (Mancini et al., 2017):

- Efficiency and cost focus;
- Growth of existing business streams;
- Growth through market disruption from new revenue streams;
- Monetisation of data itself, with the creation of new lines of business.

Benefits of Integrating AI into ERP Systems are represented by:

1. Process Automation: AI can automate repetitive tasks, freeing employees for higher value-added activities. The automation of processes through the integration of Artificial Intelligence (AI) into ERP systems represents a significant competitive advantage for enterprises, allowing them to streamline routine operations and reduce operational costs. By automating repetitive tasks such as data entry, order processing, and inventory management (Javaregowda et al, 2020), AI not only frees up valuable employee time but also minimizes the human errors associated with these processes (Surjit, 2023). This liberation of human resources from monotonous tasks enables them to focus on activities with higher added value, such as strategic analysis, innovation, and improving customer relationships (Schreyer et al., 2022). Thus, the integration of AI into ERP systems transforms the way businesses operate, leading to greater efficiency, increased productivity, and ultimately, improved market competitiveness.

2. Advanced Data Analytics: Utilizing machine learning algorithms, ERP systems can predict trends, optimize stock levels, and improve resource planning. The advanced data analytics by incorporating machine learning algorithms into ERP systems opens new avenues for anticipating market trends, optimizing stock management, and enhancing resource planning. This ability to process and analyze large volumes of data in real time allows businesses to identify hidden patterns and trends that would not have been visible through traditional analysis methods. For instance, algorithms can analyze sales history, customer feedback, and market conditions to predict future demand (Surjit, 2023), enabling companies to proactively adjust stock levels and avoid excessive costs associated with overproduction or stock shortages (Seyedan et al, 2020). Furthermore, resource planning becomes much more precise and efficient, ensuring resources are optimally allocated to meet operational and strategic requirements. Essentially, integrating machine learning into ERP turns raw data into valuable insights, empowering organizations to make informed, swift, and market-adapted decisions.

3. Operational Efficiency Enhancement: AI helps reduce errors, improve decision-making, and speed up business processes. The increase in operational efficiency through the use of Artificial Intelligence (AI) in ERP systems marks a turning point in how businesses manage and optimize their business processes. AI significantly contributes to reducing human errors, which are often inevitable in manual repetitive tasks, by implementing algorithms that can perform these tasks with superior accuracy and consistency. This reduction in errors not only improves the quality of work but also lowers the costs associated with correcting mistakes. Additionally, AI enriches the decision-making process by providing data-based analyses, which reveal hidden insights and patterns, allowing managers to make informed and strategic choices (Davenport and Ronanki,

2018). These data-driven decisions can lead to optimizations in supply chain management, resource management, and market strategies, among others. Moreover, the acceleration of business processes is another direct consequence of AI implementation, as tasks that previously required hours or even days to complete can now be accomplished in a fraction of the time, thanks to advanced automation and rapid data processing (Khamis et al, 2023). Therefore, the integration of AI into ERP systems represents a natural evolution toward a more efficient, adaptable, and competitive business environment.

The implementation of Artificial Intelligence technology significantly contributes to the increase in accuracy and efficiency of the audit process. It facilitates the early detection of potential issues in a company's financial statements and has played a crucial role in identifying suspicions of fraud in the accounting records. Furthermore, AI technology proves to be a valuable tool in recognizing problems associated with the company's accounting practices. The integration of artificial intelligence into a company's accounting operations significantly contributes to improving the precision of these processes. (Kaplan et al., 2019).

Furthermore, technological advancements have notably enhanced audit quality. The deployment of Artificial Intelligence technologies has been instrumental in guaranteeing audits are executed promptly, with heightened accuracy and comprehensive scrutiny (Aduloju et al., 2014).

Hassan et al. (2022) pointed out that individuals often adopt Artificial Intelligence technology in a passive manner, accepting its integration into their lives without a deep understanding of its mechanisms or capabilities. This form of acceptance is prevalent among those either not acquainted with AI technology or holding negative biases towards it. Conversely, active acceptance is characterized by individuals leveraging AI to their advantage or to fulfill specific objectives, grounded in a comprehensive understanding of its functionality and potential to enhance their lives. Skeptical acceptance, on the other hand, manifests in a reluctance to embrace AI technology, driven by disbelief in its feasibility or fears regarding its potential implications.

Chassinol et al. (2018) investigated how Artificial Intelligence (AI) supports auditors in detecting and preventing fraud. AI has the ability to recognize patterns in data that might indicate the presence of fraud, thus facilitating thorough investigations and the identification of those responsible. The enormous potential of AI to enhance the audit process lies in its significant acceleration of the process and ensuring audits are conducted with accuracy and efficiency. As AI continues to evolve, its role in auditing is expected to become even more crucial. Lin et al. (2019), emphasized that AI will improve the quality of accounting activities and provide more relevant information.

Methodology

The article focuses on a central question that consists in identifying the skills that future accounting professionals will develop as a result of the digitalization of the business environment dominated by the use of ERP systems or Artificial Intelligence.

In order to investigate the central question of the article, a quantitative bibliometric analysis was used. According with Donthu et al. (2021), bibliometric analysis is *“a popular and rigorous method for exploring and analyzing large volumes of scientific data”*.

This method aims to illustrate what skills accounting professionals should possess in particular and what skills they should develop in the future. We used two sample of articles which approaches topics about ERP systems, Artificial Intelligence and accounting profession. The first sample of Web of Science articles used to analyze the results was selected based on the words

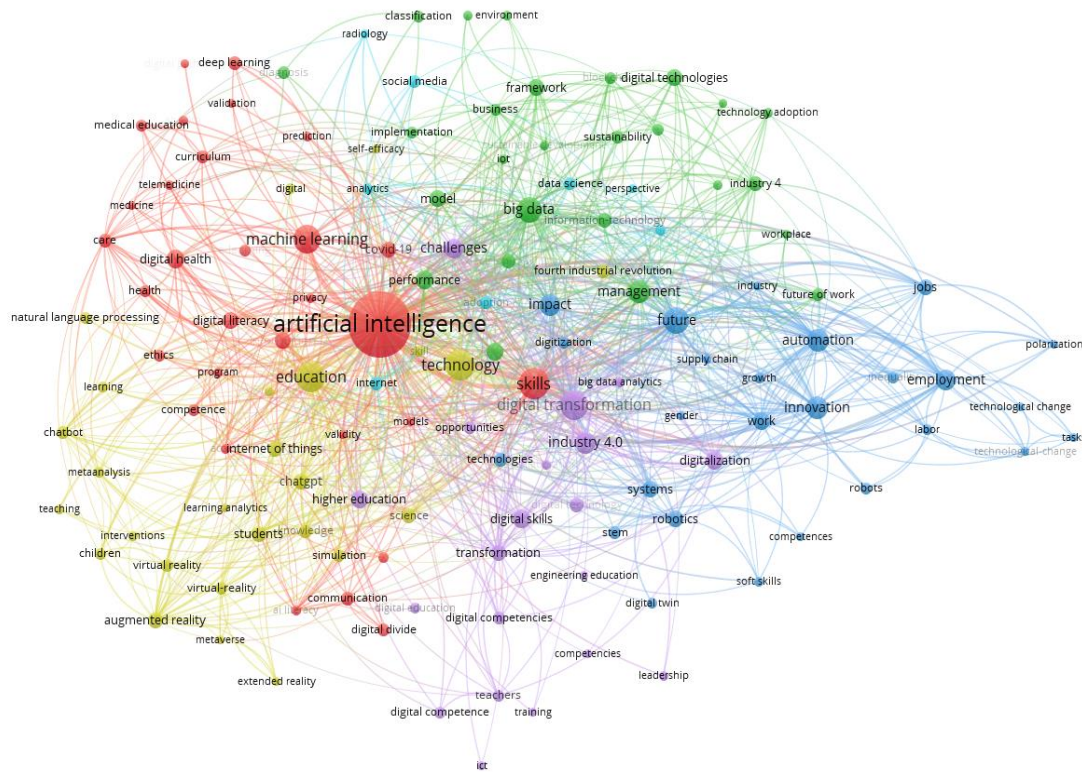


Figure 4. Competences of future professional accountants using Artificial Intelligence

Source: Author's creation.

According to the figure 3, the biggest skills they should have would be: education, digital literacy, technology, digital skills, media, gamification, design, internet skills, internet use, digital technology and digital media. Eight clusters were identified, each cluster being colored differently depending on the area or field of activity of the article written in the journals.

According to the figure 4, the main skills identified by the authors were: analytics, digital competencies, innovation, soft skills. Six clusters were identified, each cluster being colored differently depending on the area or field of activity of the article written in the journals.

The authors identified the following keywords that indicate a correlation between the main concepts identified regarding the research topic, these being presented in table 3:

Table 3. The relationship between the main concepts regarding the accounting profession, ERP systems and artificial intelligence classified according to the intensity with which they were encountered in the articles

Strong	Medium	Low
Skills	Soft skills	Telemedicine
Technology	Digital skills	Medical education
Internet / Internet use	Industry 4.0	Teacher training
Higher education	Big Data	Digital technologies
Digital competence		Sustainability
Digital transformation		

Source: Author's creation.

The accounting profession is undergoing a transformative phase, primarily driven by the advent of digital technologies. This evolution necessitates a realignment of core competencies among professionals to ensure they remain relevant and efficient in their roles (Albu and Albu, 2012). Education, as the foundation, needs to continuously integrate curricula that reflect the latest technological advancements, ensuring that upcoming accountants are well-versed in the digital landscape. (Kavanagh and Drennan, 2008).

Digital literacy stands out as a critical competency, enabling accountants to navigate through various digital platforms and tools essential for financial analysis, data management, and reporting. (Gupta and Handa, 2020). The proficiency in understanding and leveraging technology extends beyond basic software; it encompasses the ability to work with sophisticated accounting information systems, ERP (Enterprise Resource Planning) solutions, and automation tools that streamline accounting processes, thereby enhancing accuracy and efficiency (Sangster et al., 2020). Moreover, the emphasis on technology goes hand in hand with analytical thinking.

The ability to analyze vast amounts of data, interpret complex financial information, and make informed decisions is paramount. This analytical prowess is supported by digital skills, which allow for the effective utilization of data analytics and business intelligence tools. (Cao et al,2015). These competencies enable accountants to uncover insights, predict trends, and provide strategic advice to businesses, aligning financial practices with organizational goals (Richardson and Kuan, 2020).

Lastly, digital skills are not only about mastering software or platforms; they also involve understanding cybersecurity principles, data privacy, and the ethical considerations of handling sensitive financial information. As the accounting profession continues to evolve, these competencies ensure accountants can protect their organizations from digital threats and comply with regulations, maintaining trust and integrity in financial reporting (Janvrin et al., 2014).

In summary, the alignment of education, digital literacy, technology, analytical thinking, and digital skills with the evolving needs of the accounting profession is not just beneficial but essential. This alignment ensures that accountants are equipped to face the challenges of a digitalized financial landscape, driving efficiency, innovation, and strategic value for businesses.

The advantages and disadvantages of ERP systems and Artificial Intelligence on the accounting profession should be presented, these being presented in table 4.

Table 4. Advantages and disadvantages of ERP systems and Artificial Intelligence on the accounting profession

Accounting profession	Advantages	Disadvantages
ERP systems	- fast processing of financial-accounting information - storage of information in a single database and controlled access to data - a better control and monitoring of the information processed with these systems - better management of resources (financial, material and human) - accuracy and completeness of information - profit maximization - cost reduction - time saving - limiting human errors	- permanent changes in legislation, so the ERP system must always be updated - difficult adaptation to new IT systems of users who do not have sufficient IT skills or do not participate in training programs

Hubvela (2023) consider that “*Artificial Intelligence (AI) has revolutionized the accounting industry by streamlining financial processes, enhancing accuracy, automating tasks, and gaining valuable insights*”. Artificial Intelligence can detect previously hidden correlations and insights from a variety of data sources quickly, allowing for more precise financial reporting with lower associated costs (Hubvela, 2023).



As can be seen in figure 5, the accounting profession depends a lot on the use of new technologies as a result of the massive digitization of recent years. The number of articles presenting the key concepts are presented in the table 5.

Table 5. Key concepts about the future of accounting profession

Key concepts	Occurrences
Artificial Intelligence	250
Education	121
Skills	120
Technology	97
Digital transformation	63
Students	57
Impact	55
Digital divide	53
Digital literacy	51
Digital skills	48
Machine learning	48
Higher education	47
Internet	46
Innovation	46
Big Data	45
Performance	40
Digitalization	39
Management	37
Knowledge	36
Industry 4.0	35
Automation	31

Source: Author's creation.

The main countries where articles were written are presented in table 6:

Table 6. Countries where articles were written

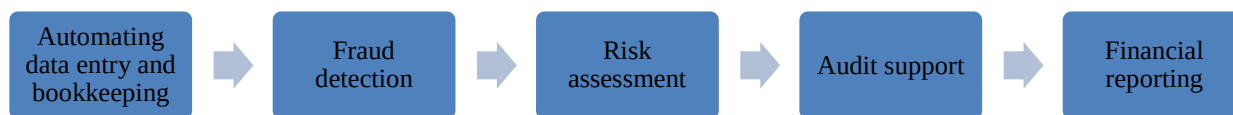
Countries	Number of documents
USA	181
Spain	133
England	126
Russia	98
Germany	77
China	77
Italy	74
Australia	67
Romania	50
Portugal	48
Canada	48
Ukraine	45

Source: Author's creation.

The most articles are written in developed countries such as USA, Spain, England, Russia, Germany, China and many others countries. These countries are developed both economically and in terms of IT infrastructure.

Artificial intelligence (AI) is rapidly transforming the accounting profession, automating tasks, improving efficiency, and providing new insights. In the figure 6 are presented the ways to use AI in accounting:

Figure 6. Ways to use AI in accounting



- **Automating data entry and bookkeeping:** AI can automatically extract data from invoices, receipts, and other financial documents, reducing manual work and improving accuracy. This frees up accountants to focus on more complex tasks.
- **Fraud detection:** AI can analyze financial data to identify patterns and anomalies that may indicate fraud. This can help businesses to prevent fraud and protect their assets.
- **Risk assessment:** AI can be used to assess the risk of financial losses, such as credit risk and operational risk. This information can be used by businesses to make better decisions about investments and other financial activities.
- **Audit support:** AI can assist auditors in identifying areas of high risk and selecting audit samples. This can help to improve the efficiency and effectiveness of audits.
- **Financial reporting:** AI can automate the generation of financial reports, such as income statements and balance sheets. This can save accountants time and allow them to focus on analyzing the data and providing insights to stakeholders.

Source: Author's creation based on Stancheva-Todorova (2018).

Stancheva-Todorova (2018) identified four different perceptions about “*AI impacts on human lives, societal environment and labour patterns*”, these are presented in table 7.

Table 7. Four different perceptions about AI impacts on human lives, societal environment and labour patterns

Scenarios	General implications	AI impacts on employment
Optimistic	– An era of nanotechnology, genetics and robotics; – People use to the highest possible extend computers' capacities; – Genetics enables changing of humans genes to avoid diseases and extend humans lives.	– Robots fully substitute humans at their work; – Humans spend their free time on leisure activities and work what they actually want.
Pessimistic	– Machines take control over the most important decisions; – Humans become endangered species; – Complex societal problems occur.	– Humans are reduced to second rate status and are fully substituted by computers; – People are not motivated to work and leave all important decisions to computers; – Full labour displacement by computers.
Pragmatic	– Control over AI technologies and their strict effective regulation; – People manage to stay a step ahead of AI.	– People exploit the power of computers and augment their skills and human decision making.
Doubting	– AI never become threat to humanity; – Computers never achieve human ability to be creative.	– In all tasks requiring creativity humans keep clear priority over the computers.

Source: Stancheva-Todorova (2018).

So, the potential effects after the automation technologies can be observed in table 8.

Table 8. Automation technologies and their potential effects

Effects	Description
Cognitive capabilities	- Robots and computers increase their capabilities to accomplish activities, including cognitive capabilities as making tacit judgments, sensing emotion and driving.
Productivity growth	- Labour cost reductions, increased throughput, higher quality, and decreased downtime
Automation potential	- Only few occupations could be fully automated based on the currently demonstrated technologies. - About half of the world's workforce paid activities could potentially be automated by adapting existing technological innovations.
Pace, extent of automation and impact on workers	- Would vary across different activities, occupations, and wage and skill levels;
Effects across countries and sectors	- A wide range of effects depending on country's stage of development; - The sector mix and the mix of activities within sector are the key factors for revealing automation potential.
Key factors influencing the pace and extent of automation	- Technical feasibility; - The cost of developing and deploying automation solutions; - Labour market dynamics; - Economic benefits; - Regulatory and social acceptance.
Effects on employment	- Changes in the nature of work; - Human labour will become complementary to the work of the machine; - Changes in companies' organisation, industries' competition patterns and business models.
Issues for policymakers	- Encourage investments to stimulate technological progress and innovations through appropriate policy; - Develop policies that help workers and institutions to adapt to the impact of automation on employment.

Source: Stancheva-Todorova (2018).

Areas of AI or ERP systems impact on accounting profession are represented by: new skills to obtain accounting profession, new tasks and roles, education and training, task displacement.

Conclusion

Digitization refers to the displacement and profound transformation of activities and their organization (Berger and Frey, 2016). Thus, an evolution of the skills that accounting professionals should have as a result of digitalization phenomena was observed. The results of the study indicate first of all, that the studies of future accounting professionals contribute to observing the effect of digitization.

It is recommended that all employees follow university studies to acquire the deepest possible digital skills that will help them carry out their work in the most optimal conditions.

The benefits of AI in accounting include the automation of mundane and repetitive tasks, enhancing accuracy and efficiency, streamlining financial processes, and gaining valuable insights. Human expertise must be encouraged to allow accounting professionals to bring a unique capability to decision-making environments, not to compete with AI. Using AI allows solving a problem without using manually coded software that contains detailed instructions.

Artificial Intelligence has a significant impact on work, manufacturing, knowledge management, decision support, fuzzy logic approach, risk management (Rouhiainen, 2019). Artificial Intelligence will develop a sense of initiative and entrepreneurial capacity within organizations, developing persuasive communication with employees helping to promote goods and services.

Industry 4.0 offers a broad vision of commercial society in the age of technology. New technologies offer accounting professionals opportunities to monitor company performance (financial performance, ecological performance, economic performance).

The conclusion of the article demonstrates how much the activities of professional accountants have evolved as a result of the digitization of their activities, using ERP (Enterprise Resource Planning) systems. As a result of digitization and the use of ERP systems or Artificial Intelligence, the work of accounting professionals has undergone a series of changes, streamlining a series of redundant activities. Thus, all repetitive activities have been eliminated as a result of the use of ERP systems or Artificial Intelligence that have the role of processing all information and storing it at the level of its database. AI is not replacing accountants, augmenting the skills of accountants, allowing them to focus on more complex tasks, such as providing strategic advice and developing new business models. Accountants who embrace AI or ERP systems and develop the skills to work effectively with these new technologies will be well-positioned for success in the future.

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