

## ARTIFICIAL INTELLIGENCE APPROACHES IN FINANCE AND ACCOUNTING

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**Abstract:** *This paper takes an integrated approach to accounting from several perspectives, starting from a study of the international literature and transposing the main Society 5 benchmarks to highlight their impact. Artificial intelligence refers to the field of computer science that goes beyond classical computer science, aimed at solving problems for which there is no classical computational algorithm in an efficient way. The intelligent system must be able to do more than just solve problems that require computing power, memorization and retrieval of knowledge or just reasoning control, it should be able to see, speak, hear, understand and reason and command similarly to humans. These are big challenges for intelligent systems, which is why the attention of researchers and the business world is increasingly turning to artificial intelligence.*

**Keywords:** IT management, educational finance, accounting

**JEL classification:** M15, I22, M41

### Introduction

Society 5.0 is mainly focused on four main areas: health, mobility, infrastructure and digital technologies, and its development is based on taking advantage of the opportunities offered by information and communication technologies, including mobile learning opportunities (Benedek-Molnár, 2014). Professionals and the majority of society itself are already preparing for the era of Society 5.0, but in the meantime some questions may arise, such as "Are we really ready for the challenges of Society 5.0?", "Are we really living our digital lives professionally?". This has become particularly acute in the last few months during the period of the coronavirus epidemic, where the opportunities offered by digital technology have become much more important than before. Globalisation itself has opened up a new range of problems, socio-economic, political and economic and cultural innovations and has demonstrated its potential to force change in many areas (Kemp, 2017).

A trend influencing the business world is the transformation of technology and adaptation to a changed working environment brought about by digitalisation. In particular, the efforts that are being made to invest resources in people, to use technological solutions for human resources. And as internet usage, mobile apps and social networking increase, more users are coming online and service providers are developing their services and the resources and infrastructure to support them. Digital solutions will bring many improvements, better service and higher added value for economic operators, both in terms of services and the resources and infrastructure that support them. By digitalising human resources, we mean the adaptation of employees' activities to make the

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most of the possibilities offered by digital technologies, requires significant resources initially, but in the longer term it will reduce costs and increase profits. In this context, companies are reassessing their potential in relation to the digital knowledge society, knowledge management (Bencsik, 2018), and are giving high priority to the development of new products and services (Bathla, 2018).

Recording data in accounting is a precise, up-to-date, easily accessible activity. In recent years, the obligation of companies to provide data, to prepare the statements requested by the head of the company, to prepare annual accounts (balance sheet and profit and loss account, supplementary annex), to prepare financial calculations, which is the task of the accountant, has increased significantly.

These days, approaches are diverse and the impact of technology on accounting activities is challenging accountants to reconfigure their work and generating innovation through the creation of digital accounting platforms. The role of research on the accounting profession is evolving so that many activities are susceptible to digitisation with a large and varied literature dealing with artificial intelligence applicable to accounting.

### **Research methodology**

A review of bibliographic sources and legislation allows us to apply a few terms to define, identify and measure artificial intelligence applicable to finance and accounting.

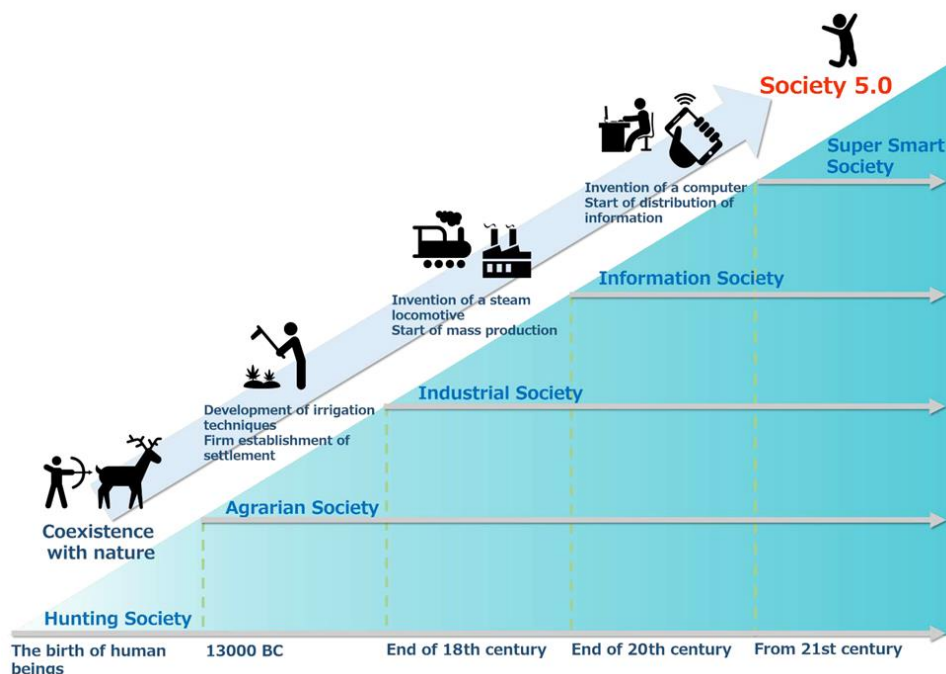
In looking at a complete and comprehensive analysis of artificial intelligence, we have chosen to focus on the field of finance and accounting, which gives us the opportunity to explore the usefulness of intelligence in such a business, and the methods it uses to streamline the business. As such, this section mostly includes work on general and special digitisation for these areas, as well as accounting software related to these aspects.

### **The impact of Society 5.0 on the accountancy profession**

In Society 5.0, the collection of data about society as a whole is much more broadly based and AI methods help to analyse this data in new ways (Balogh et al., 2019). The information revealed by the results of these analyses will be made available to the participants of society in various forms, whether it is state-of-the-art AR (Rumiński, Maik, Walczak, 2019) or 3D VR technologies. These processes can create new value, both in industrial and societal contexts, including in a narrower field of accounting. A study by Akhter & Sultana (2018) showed how advances in machine learning, robotics and artificial intelligence (Smieszek et al, 2019) it will contribute to the general promotion of the audit profession. Digital technologies represent advances in many areas, and it is also worth bearing in mind that artificial intelligence, complex intelligent systems (Maldonato et al, 2018), robotics and machine learning offer fewer errors and higher, faster processing speeds and performance, whether in accounting and financial processes and demand forecasting (Szántai, Kovács, Egri, 2018) or even in e-governance. Of course, this is not true for all aspects of accounting, it will remain the case for highly skilled accountants, but the services provided by the profession are pointing towards greater use of digital technologies. Artificial intelligence can support professionals in a number of areas and increase efficiency, but it will not replace human emotional intelligence and critical thinking skills for some time yet.

A prerequisite for the development brought by both Industrial Revolution 4.0 and Society 5.0 is that society, the economy, can implement it as widely as possible and reap the benefits, leading to a Super Smart Society (Figure 1). This will require digitally literate professionals, which will also require a reform of education. The use of digital technologies to support learning activities, such as the possibilities offered by smartphones, or even the learning environments offered by Google Classroom and Edmodo. From an accounting perspective, information and communication technologies, such as computerised accounting, investment management, investment fund analysis (Matuszewska et al., 2019), provide economic actors with opportunities that can provide new

foundations for the development of their activities. Society 5.0 essentially takes on the digitalisation and transformation dimension, solving problems that we were previously unable to solve when everything was interconnected.



**Figure 1.** Evolutionary aspects of the Society 5.0 concept

*Source:* Keidanren, [http://www.keidanren.or.jp/en/policy/2016/029\\_outline.pdf](http://www.keidanren.or.jp/en/policy/2016/029_outline.pdf)

### Accounting for NGOs

NGOs must keep separate accounts for their income, all the costs and activities associated with their activities and their business activities. The general rules for bookkeeping and accounting are laid down in the Accounting Act (Act C of 2000). The rules of the Act also apply to NGOs. Foundations and associations fall under the definition of "other organisations" within the meaning of this Act. These records must be kept in accordance with the accounting rules set out in the Accounting Act, in accordance with Government Decree 479/2016 (XII.28). According to this Government Decree, NGOs, foundations and associations are also required to keep accounts and therefore need an accountant. The form of the accounts is determined by the activity of the organisation, the amount of annual income and the way the accounts are kept. The accounts show the assets and liabilities of the organisation at 31 December. The revenues of an NGO are mainly derived from membership fees, in the case of a foundation, from a payment received from the founder, and from assets placed at the disposal of the foundation by the founder, from economic and business activities (provision of services), from grants or other subsidies, donations. Costs and expenses are mainly costs directly linked to the activity (public benefit) of the foundation, the economic and entrepreneurial activity, the operating costs of the NGO and the depreciation of intangible and tangible assets used for the activity.

The accounting rules under the Accounting Act, as the accounting policy, are mandatory regardless of the method of the accounting. The objective of accounting policies is to provide the organisation with an accounting system that enables it to prepare annual accounts that give reliable and fair information. The accounting policy shall include the rules for the inventory and valuation of assets and liabilities, the rules for the scrapping and valuation of assets and liabilities, the cash

management policy and, in the case of double-entry bookkeeping, the accounting rules and the accounting voucher.

From 1 January 2019, the National Tax and Customs Administration will communicate with businesses exclusively through the Company Gate service. The NAV 2.0 programme was launched in the summer of 2017, with the aim of creating a paperless office. Accountancy offices are also increasingly striving to use modern IT solutions and implement digital accountancy offices. This process is also driven by the ever-increasing volume and deadlines for the provision of office data. There is a growing need to monitor processes, support their planning and business decisions. Meeting these challenges will not be possible without the use of digital technologies. Processes and the future trends in the digitalisation of accounting are key factors in the economic operation of NGOs, and therefore the trends in accounting and data processing cannot be ignored.

### **The importance of digital technologies in data processing**

This is defined by the National Institute of Standards and Technology (NIST) as "a model that enables ubiquitous, convenient, on-demand access to networked, configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly deployed and made available as a service at lower cost" (Mell and Grance, 2011). A key determinant of the digitalisation process, while technological change is one of the main drivers, it alone only offers the basis for the development of such services that will lead to more progress in society.

Significant changes have taken place in recent years in the evolution of technology and education in different parts of the world. However, in the practical world, the world of technology that is changing the accounting and finance industry is not making the human factor irrelevant. By contrast, technologies such as the cloud and artificial intelligence (AI) are empowering accounting - and the accounting-financial services industry as a whole - by making data entry much lighter manually and improving the speed, accuracy and high quality of data.

### **Results of the study**

These days, digital information technologies are used across many areas of society and in many areas of business. Part of this transformation, which is currently referred to as Industrial Revolution 4.0 or the Digital Transformation (Racsco, 2017), is focused on advanced digital solutions and technologies, including big-data computing (Vukmirovic et al., 2018), advanced artificial intelligence, robotic robots, the cloud and the use of virtual reality.

Machine learning is used by computer applications to mine and process data (Moldovan, 2019) and produce analyses to guide process optimisation and improvement. Today, advances in artificial intelligence have resulted in systems that offer different solutions in different sectors, whether we think of healthcare, banking or automotive. In order to remain competitive, many economic actors have moved in the following direction:

- developing information networks,
- creating new infrastructures,
- cloud and data recovery applications,
- process integration capability (Internet of Things, wearables, etc.),
- using the artificial intelligences.

The possibilities have become virtually limitless as a result of highly automated task execution, and as a consequence, the importance of formal intermediaries and institutions is diminishing. In practice, in everyday life, the idea of the 'information society', so often put forward by economic operators, as a concept focusing on the Internet and the practical use of information technology, is also about the spread of information and communication technologies, whether it is about the European Union, eGovernment or the digital divide.

### **The impact of digital technologies on accounting**

To better process information, accounting has gradually changed over the centuries and to help meet many performance reporting obligations. In the business world, accounting serves a large part of the information that arises in connection with management. The combination of internationalization and modern business structures has accelerated the digitisation process and reinforced the importance of the data-value link. In accounting, too, services and the processing and analysis of information have been continuously improved and enriched to meet both internal and external needs. On the one hand, there have been advances in accounting reporting and auditing, and on the other hand, there have been advances in business decision support, such as the use of ERP (enterprise resource planning) systems, business intelligence (Farrokhi, Pokorádi, Sahar, 2018).

The development of international relations has brought new challenges in the field of accounting. Companies increasingly felt the need for a "common language", as the fact that everyone spoke one language, namely English, did not fully ensure that information was transferred in a way that was meaningful. Currently, the rigid, indicator-based rules of the International Harmonisation Plan were applied. Today, only a certain well-defined group of companies are obliged to comply with international accounting rules (IFRS-IAS), mainly those listed on national stock exchanges and those that are significant in terms of size at the level of the national economy. Others may choose to report under IAS.

There has been much speculation recently about the future of accountancy: will accountants be needed in the future? Will accountants have a job, will robots take the jobs of accountants? Will robots and accountants be replaced by robots? If we are able to process more and more data digitally in the general ledger, the risk of error and misstatement will be minimised thanks to technology. Error can also occur at system level, for example with a wrongly parameterised scan. However, the fast scanning of the data allows more time for checking, sorting individual events and advising. Regardless of automation, economic events such as invoices need to be checked before they are recorded to see if they were issued correctly, if the tax number of the issuer is valid, etc., and automated checking capabilities can also be of great help here.

German-based software company Smacc (2020) is using smart IT to facilitate the automation of accounting and financial reporting systems for sole traders and small and medium-sized enterprises. The data-driven software uses over 60 data connections to examine receipts and invoices, check that they are arithmetically correct and verify, for example, that the correct VAT content is entered. When the application has figured out how to manage the economic transactions of each supplier, it then performs the accounting tasks automatically. Its artificial intelligence enables self-learning and continuously improves its capacity to organise and structure information. Users can now check their spending data and statements online at any time, so they don't have to leave it until the end of the month, for example, to check their current finances. Many other developers offer similar services, such as QuickBooks (2020), but Smacc is one of the first to use AI to improve its accounting automation capabilities.

Digitalisation is also having a significant impact on the nature of accountants' work. With less manual data entry, fewer errors and mistakes, data management and reconciliation will be significantly speeded up, and the focus of accounting work will shift to control processes. With digitisation, accounting is no longer about recording data, but more about data analysis, advice and control. The advent of digital solutions in the accounting world can make the work of accountants easier, but there are still few enterprising professionals who can do their job with a little more research and a lot less effort.

With modern digitisation, the level of automation in accounting can reach an ever higher level, and intelligent processes can now lead to almost fully automated accounting and therefore cost efficiency. In this integration of blockchain technology with a smart contract accounting system, a significant factor is ensuring that appropriate legislative frameworks and accountability practices are consistently applied in the post-execution recording of each contract. Through smart

contracts, a transaction can be fully implementable based on the applicable standard, guidelines and applicable legal and other rules (Smith, 2018).

Al-Htaybat and von Alberti-Alhtaybat (2018) are a good example of identifying the core competences required by the accounting profession. For example, the ability to support accountants in making decisions, assessing risks and building positive client relationships are important aspects. Accountants need to have a range of advisory skills to help clients predict and evaluate financial decisions that an IT system cannot yet do.

As IT develops, cloud technology and the solutions based on it are also becoming more and more prominent. Cloud solutions provide instant access to applications, data and processing resources. An important benefit of a cloud-based system is the continuous updating of information, allowing accountants and clients to instantly analyse current data and make the most appropriate decisions based on the most up-to-date information. Cloud technology can provide constant monitoring, not just periodic analysis.

But accountants need not worry about losing their jobs due to the automation capabilities of AI in accounting tasks. The focus of accountants' tasks will shift from tracking revenues and preparing basic reports to other tasks, such as advising on tax planning or reviewing financial operations, investments and developing financial strategy.

### **The challenges of education**

The field of education raises problems that have been constantly present in the rapid development of the last period, such as how education can typically keep up with the pace of technological progress, school infrastructure is often not up to the level of sophistication of the tools used in everyday life in the 21st century. Education is about building up a store of learning and teaching theory and practice, and it should provide an inspiring experience (Oxford English Dictionary). Educating means brainstorming new ideas, reflecting on experiences, applying skills, as well as problem solving or problem formulation. One can also think here of the teaching of practical and technical skills, but perhaps also of accounting in double-entry or even variability calculation or NPV calculation. In the world of education, many analyses still show that the use of IT in the classroom, its infrastructural background still needs further development, and that accountants partly underestimate the need for technological competences for the digital age (Watty et al. 2016).

Although the work in schools is still based on the collaborative activity of students and teachers, since Prensky's study (2001) the main actors are very often referred to as digital natives and digital immigrants rather than the traditional term.

Research shows (Schrauf, 2019) that the quality of teachers' work is the most important factor influencing students' outcomes, and therefore the methods, values and attitudes of teachers are crucial (Molnár, 2011). Their work has changed a lot in recent years, and the constantly and extremely fast changing info-communication tools provide an almost inexhaustible pool of new possibilities, which draws even more attention to the work in schools. This is facilitated by the range of networking solutions and the expansion of mobile communication devices (Molnár et al, 2017).

The use of data processing is growing very rapidly and is starting to take over some of the basic tasks performed by accountants (recording transactions, processing transactions, sorting transactions). A high level of data processing can improve both cost efficiency and work efficiency (Al-Htaybat and von Alberti-Alhtaybat, 2018). Accounting practices will benefit greatly from a more coherent and comprehensive incorporation of technological improvements, thus improving all aspects of accounting.

Accounting education is facing significant opportunities and challenges due to the need for digital competences and rapidly evolving technology. According to Al-Htaybat et al. (2018), case solving, problem analysis, practical skills, decision-making and assessment, as well as skills

relevant to accounting principles such as double-entry bookkeeping and accounting standards are essential. In addition, the ability to analyse data and statistical skills are also increasingly in demand in the accounting profession.

In the light of the processes outlined above, the accountants of the future need to acquire the skills in schools to adapt to a changing society and even to participate actively in that change. In addition to modern teaching methods, such as project-based learning (Schrauf, 2019) or gamification, students need to acquire digital competences that are even more closely related to the field of informatics. In order to achieve this, teachers need to be trained in the use of state-of-the-art ICT-based education technologies and in teaching state-of-the-art technologies (András et al, 2016). Accounting is also becoming a discipline that will require a combination of human and real skills and competences for the accountants of the future. However, due to the rapid changes in technology, learning beyond school does not stop, continuous training and development of individual skills will remain essential even after the school years.

Knowledge of auditing and standards is essential for acquiring audit and accounting skills (Fülöp, 2019), which can reduce the shortcomings of audit activity. Although the role of the International Accounting Education Standards Board (IAESB) is to define independent accounting education standards that set out both the professional competencies and skills to be acquired and the professional ethics and attitudes to be adopted (Fülöp, 2020; Tiron-Tudor, 2020).

In the future, the authors of the study envision an education system in which mathematics, the application of information systems and programming of subjects such as philosophy and language will all be essential requirements in the education of accountants.

### **Conclusions**

The digital age is inevitable, and it will transform the way operators do business in order to remain competitive, and it will also bring cost optimisation opportunities to the fore. In many areas, this evolution will force organisations to digitally transform both their external and internal processes. While the automation potential of digital transformation may reduce the need for human resources in certain work processes, the increased demand for AI opportunities will create jobs requiring new skills. The development of digital technologies will therefore lead to organisational transformations, and institutions will need to integrate these evolving technologies into their processes. This will be the key to the competitiveness of economic operators in the future.

Artificial intelligence and machine learning cannot replace human intelligence in all areas. The main benefit of these technologies is that they provide better and faster access to a wide range of real-time information from multiple sources for accountants, who can then use it to provide timely and more informed advice and prepare decisions.

The study highlighted some of the facts and made some recommendations that should be considered important in the digital world that will shape the future of business, such as the transformation of accountancy skills, the promotion of accountancy, and the increasing role of consultants. This transformation will only be successful if the training of future accountants recognises these changes and shapes education to prepare students for these new challenges. However, it is not only the training system that needs to recognise the new challenges, but also the students themselves need to recognise that, beyond the structured training, they need to be able to develop, learn and develop themselves throughout their lives in order to keep up with the continuous changes and the development of Industry 4.0. We believe that this study contributes to a more conscious identification, reassessment and review of the consequences of digital technology change and the adaptation of newer generations of society for a sustainable future.

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