

Chapter 8

Artificial Intelligence in Internal Audit and Risk Assessment

Sezer Bozkus Kahyaoglu¹, Tamer Aksoy²

Abstract In this study, the effects of artificial intelligence applications, which have gained importance recently, on internal audit and risk assessment are analyzed. Internal audit and risk assessment are critical for the early detection of risks that arise in the processes of businesses that are becoming more complex and exposed to external factors due to digitalization. With the internet of things that are generally accepted all over the world, there are significant differences in the way businesses do business. This situation also forces companies to differentiate internal audit and risk assessment, which is a strategic and integral element of management processes. In this context, this study focuses on the challenges and opportunities faced by internal audit and risk assessment because of digitalization, big data analysis and artificial intelligence applications depending on the rapidly developing digital work environments. Accordingly, the study includes in-depth analysis to contribute to the particularly relevant literature and to develop policy recommendations for audit and risk management professionals.

Key Words: Internal audit, artificial intelligence, machine learning, risk assessment, early detection of risks, digitalization, big data analysis, deep learning, data processing, digital literacy

8.1 Introduction

Studies on artificial intelligence (AI), which started with Alan Turing (1952), have taken their place in the literature among the most important developments and innovations accepted recently. In this context, it can be stated that AI has entered every area of our lives, or, if it has not yet entered, there is little time left for it to enter (OECD, 2019). This situation is beginning to deeply affect the whole society, all countries, the way international trade is done, and all the institutions and essentially all businesses.

This approach can be expressed as a "macro" perspective that includes the whole economy and trade. Looking into the details of this macro perspective, it is important to consider the meso

¹ Sezer Bozkus Kahyaoglu (Corresponding author)
Department of Accounting and Finance
Izmir Bakircay University,
Izmir, Turkey
E-mail: sezer.bozkus@bakircay.edu.tr
ORCID: 0000-0003-2865-3399

² Tamer Aksoy
Department of Business Management
Ibn Haldun University, School of Business,
Basaksehir, Istanbul, Turkey
E-mail: tameraksoy1965@gmail.com
ORCID: 000-0001-6483-4547

and micro perspectives as well. From the meso and micro perspectives, it is necessary to examine the effects of the AI issues discussed here on social life, as well as the business processes of individual enterprises, even the employee profile (Commander et al., 2011).

In this context, this study reveals how internal audit and risk assessment activities, which have an important place in businesses, are affected because of the rapid development of AI applications. It explains what the internal audit and risk assessment structure needs to do in order to maintain its "seat at the table" in the face of global developments and to fully meet its status as a "trusted advisor". Opportunities and threats are revealed based on the change in business processes, workplaces, and workers experienced with internal audit and digitalization (Bresnahan et al., 2002; Capitani, 2018). AI requires a very important change and transformation to take place in organizations. In this context, issues that the internal audit must keep up with are examined. Besides, the implications of the ethical dilemma with AI on internal audit and risk assessment are also discussed (Sambamurthy and Zmud, 2017).

The finance sector has a special place and importance among the sectors where digital transformation and AI applications are taking place at the highest speed. In this respect, financial technological developments are shortly defined as "Fintech". Due to the structure of financial markets, trade operations, transactions, and their vulnerability to financial crises in the global competitive environment, the supervision, audit, and risk assessment of financial markets are also critical. New techniques developed in this respect are generally referred to as "Regtech", like Fintech (Arner et al, 2016).

8.2 Understanding the AI to Adapt Changing Audit Universe: Macro Level Analysis

It is a fact that AI has entered all areas of our lives. An example of this is "speech recognition", "language processing", "machine learning", "deep learning", "market algorithms", "computer vision", and more (Porter and Heppelmann, 2015). This structure differentiates the decision-making mechanisms, job descriptions, and strategic goals of the enterprises. As a concrete example of this, looking at the ranking of the 10 largest companies with the highest market capitalization in the world in the past 10 years to present (2006-2019) provides important information. Because the fields of activity of the biggest ones have shifted to the business lines defined as "network economy" with the effect of new technological developments, specifically AI.

In this kind of network economy, there will be mostly "virtual teams" who have a work culture that is based on across time, space, and corporate boundaries to collaborate taking advantage of digitalization (Wilson et al., 2017).

As can be seen in Figure 1 that explains this situation, it is observed that the top 10 companies have a quite different and flexible organizational structure from the conventional business lines of the last decade. It can be stated that the basis of this difference and flexibility is big data analysis, AI, and digital business models (Andjelkovic, 2015; Vasarhelyi, 2015).

2006 (Million \$)			2019		
1		Exxon Mobil 446,943 ▲	1		Apple Inc.▲ 1,305,000 ^[12]
2		General Electric 383,564 ▲	2		Microsoft ▲ 1,203,000 ^[11]
3		Microsoft 293,537 ▲	3		Alphabet Inc. 922,130 ^[14] ▲
4		Citigroup 273,691 ▲	4		Amazon.com 916,150 ^[13] ▲
5		Gazprom 271,482 ▲	5		Facebook, Inc. 585,320 ^[16] ▲
6		Bank of China 254,592 ▲	6		Alibaba Group 569,010 ^[17] ▲
7		Toyota Motor 241,161 ▲	7		Berkshire Hathaway 553,530 ^[15] ▲
8		Bank of America 239,758 ▼	8		Tencent ▲ 461,370 ^[18]
9		Royal Dutch Shell 225,781 ▲	9		JPMorgan Chase 437,230 ^[21] ▲
10		BP 218,643 ▲	10		Visa 416,790 ^[20] ▲

Figure 8.1. List of top 10 companies with the largest market capitalization. Source: https://en.wikipedia.org/wiki/List_of_public_corporations_by_market_capitalization

As can be seen in Figure 1 that explains this situation, it is observed that the top 10 companies have a quite different and flexible organizational structure from the conventional business lines of the last decade. It can be stated that the basis of this difference and flexibility is big data analysis, AI, and digital business model (Johnson et al., 2008). This is defined as the "power of the network economy" in the literature (Kandeh and Alsahli, 2020). On the other hand, sometimes this situation is called "gig economy" as well to indicate the future of work (Figure 2).



Figure 8.2. Gig economy as future of work. Source: Stafford, 2018. [The Future of Work & The GIG Economy - Rural \(slideshare.net\)](https://www.slideshare.net/Stafford2018/The-Future-of-Work-The-GIG-Economy-Rural)

The gig economy is based on a flexible work environment with people who have specific experience, high technical skills, and soft skills, respectively. In this way, both people and companies generate “high value” (Stafford, 2018).

It is expected soon to experience "driverless cars", "robots in the factories", and "chain stores without cashiers" reminds the visions of a jobless future for many people. This is since "automation", "digitalization" and AI implementations, in general, are ongoing processes that will be eliminating some jobs. This may be a difficult situation for those who are not adapting to the new work environment and technological innovations at all. Rather, if they do so, they will have the opportunity to work at new jobs in a digital work environment. In this context, it should be noted that the changing nature of work increases the returns on soft skills and digital skills (Wodechi, 2019).

It is important to differentiate between tasks that are routine, and non-routine. Because non-routine tasks mean that they are open to the replacement and require more “resilience, productivity, creativity, problem-solving, and good communications” that will provide sustainable jobs (Westland, 2020).

Manyika et al. (2017a, b) and Bughin et al. (2018) from the McKinsey Institute (2017), like Frey and Osborne (2013) prepare the detailed occupational task descriptions. These authors divide tasks at work into seven broad buckets. Hence, they basically estimate the distribution of all work that is performed across these seven groups. Among these seven groups, there are three task groups that have high potential for automation (Figure 8.3.a):

- 1. “predictable physical work” (81 percent automatable).
- 2. “data processing” (69 percent automatable).
- 3. “data collection” (64 percent automatable).

It should be noted that these works jointly account for more than half (51 percent) of all performed work hours, according to their estimates.

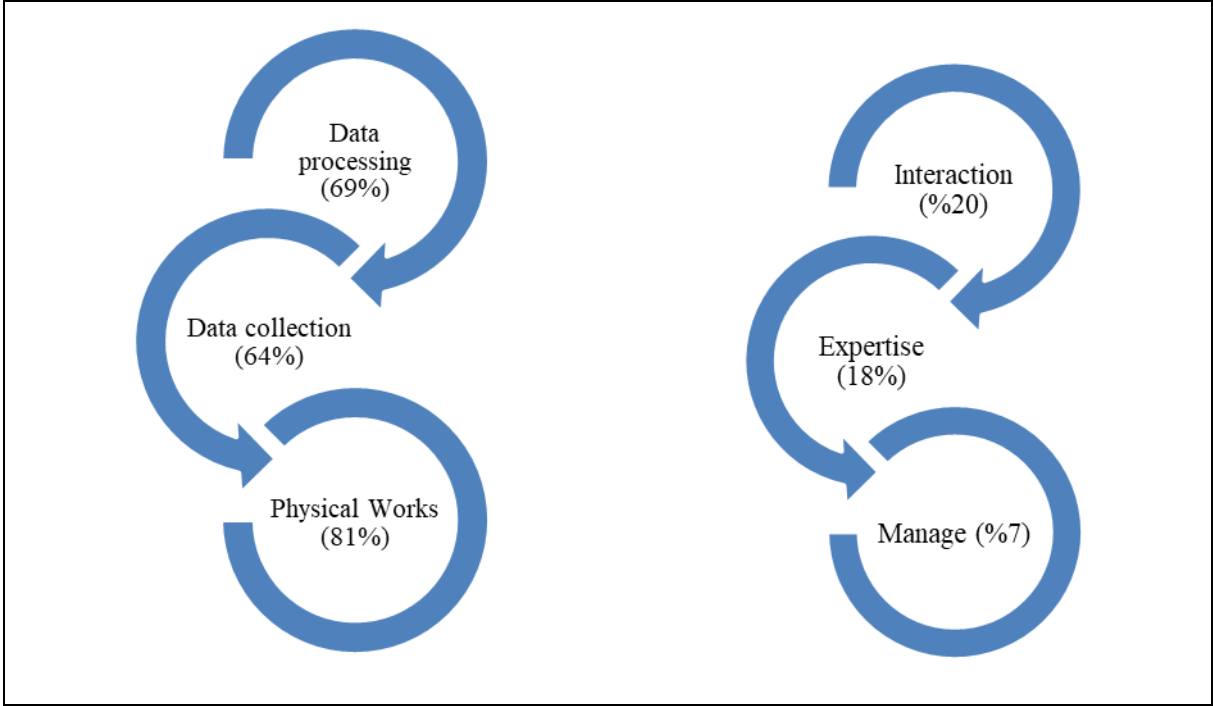


Figure 8.3.a. Tasks with high potential for automation

Figure 8.3.b. Tasks with low potential for automation

Source: (McKinsey Institute, 2017).

According to these authors, in contrast to the three tasks mentioned in Figure 8.3.a, the other four task groups have lower automation potential which is presented in Figure 8.3.b respectively.

These are as follows:

1. “unpredictable physical work” (26 percent automatable).
2. “interface-personal interactions” (20 percent automatable).
3. “expertise, including decision making, planning, and creative” tasks (18 percent automatable).
4. “manage, including managing and developing people” (7 percent automatable).

This situation may also adversely affect the distribution of female and male labor force in the business world and trigger an increase in the gender gap (World Economic Forum, 2018). According to the research conducted by the World Economic Forum (2018), if the development of AI applications in the top 20 countries of the world continues at a similar pace, it is estimated that the balance between men and women may deteriorate further, i.e. gender gap increases in time (Figure 8.4.a.). According to LinkedIn (2019) findings, which conducted a similar research study, it is emphasized that the effects of the gender gap will become more pronounced in the future, as technical competencies related to artificial intelligence are less in women when viewed based on professions (Figure 8.4.b).

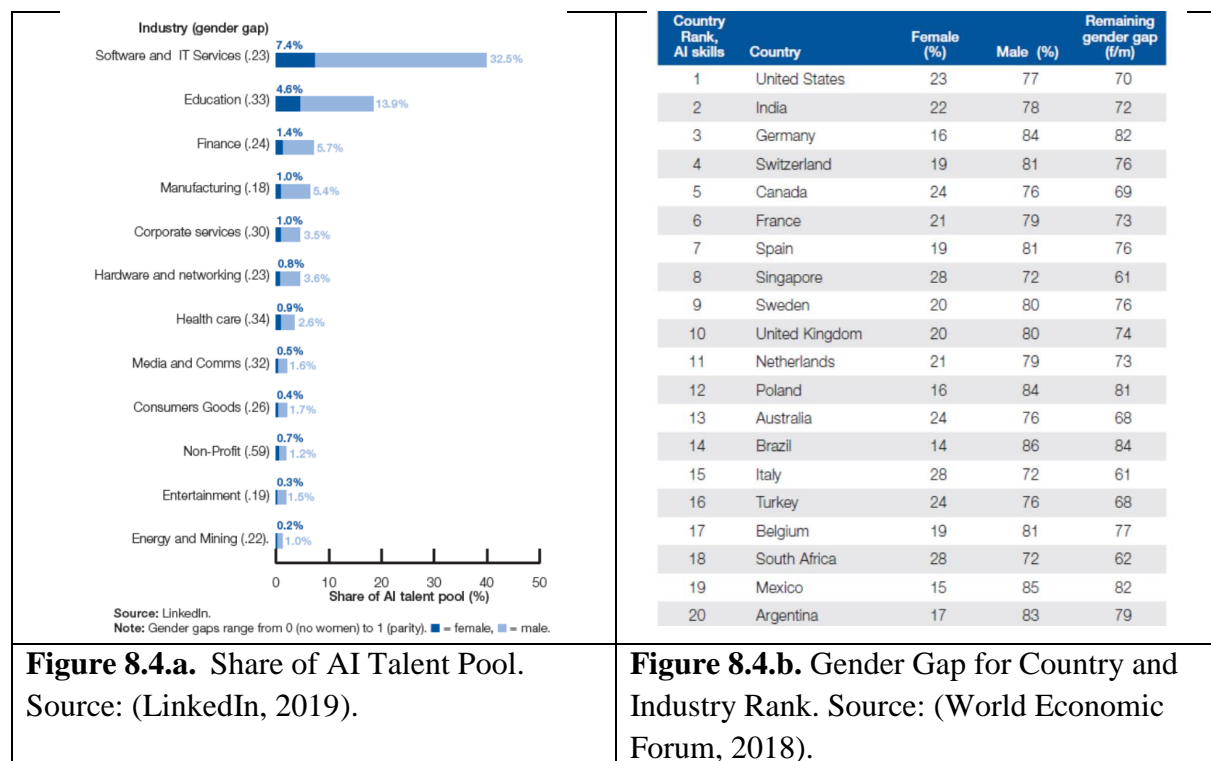


Figure 8.4.a. Share of AI Talent Pool. Source: (LinkedIn, 2019).

Figure 8.4.b. Gender Gap for Country and Industry Rank. Source: (World Economic Forum, 2018).

It should be noted that basic "digital literacy" will be essential in almost all jobs in the future. In this respect, internal auditors should get ready for high levels of demand predicted both for technical skills—to develop, enforce and operate with new technologies—and for social skills such as responsible leadership, teamwork, and social interaction (Bughin et al. 2018).

On the one hand, individual willingness to learn new technical and social skills is important, business executives highlight the need for public policies to provide guidance and financial supports to those jobs may be at risk from automation shortly.

In this case, those who take part in internal audit and risk assessment processes must pay attention to these developments expected in the business world regarding the gender gap. Because most of the audits are based on monitoring human behavior to determine internal control weaknesses in the processes and sub-processes of the organization and preventing possible misconduct cases, they must know the predictions of the employee profile. In this respect, they should determine the audit universe and risk universe accordingly.

After discussing the general effects of artificial intelligence from a macro perspective, related to this, the meso and micro-level perspectives are discussed below. When considered as a macro-level global perspective and “big picture-audit universe”, the meso level refers to intergroup relations and social networks in the new working environment. Micro-level is used to describe individuals (Figure 8.5).

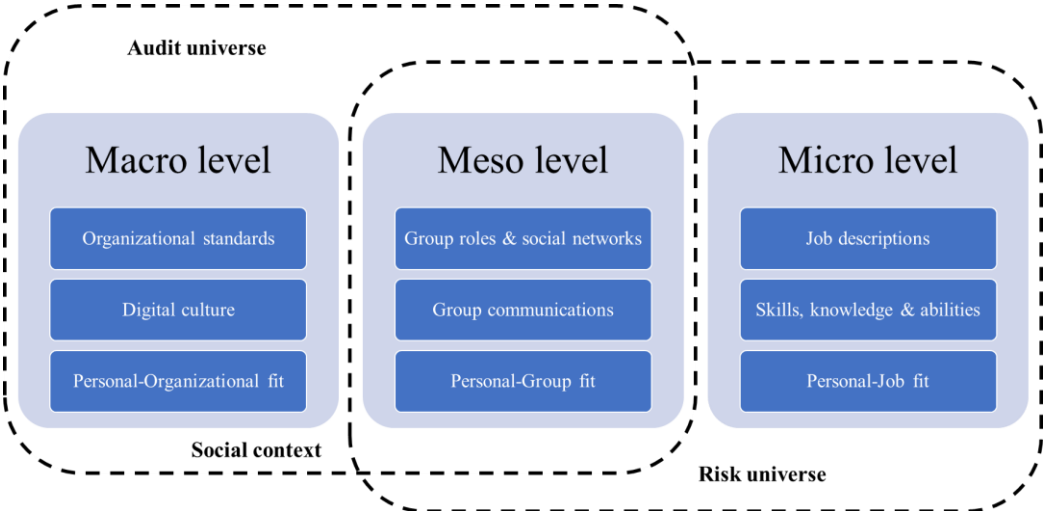


Figure 8.5. The Effects of AI on Internal Audit at Macro, Meso and Micro Levels. Source: Adapted from Buettner, 2014.

In this context, it is important to restructure internal audit and risk assessment activities and to use audit tools and techniques suitable for the new working culture. Therefore, first, information is given by explaining what has changed, how and why. It should be noted that the meso and micro level contain the “risk universe” which is essential to assure for value-added audit approach.

8.3 Understanding the AI to Adapt Changing Risk Universe: Meso and Micro Level Analysis

Another change due to AI implementations that is as important as the gender gap is the future of work expectations about the “responsible leadership profile”. Leadership approaches should have the characteristics of responsible leadership and internalize ethical decision-making processes while demonstrating ethical behavior (Ireland and Webb, 2007).

Due to the increasing use of advanced technology in the business world and the fast, remote, and flexible working style of the employees, changes occur in decision-making processes. With this change, besides legal regulations, legislative compliance and control activities, ethical codes gain importance. The most important reason for this is that it is the ethical indispensability to manage anomalies caused by artificial intelligence applications.

Work, workplace, and workers are changing, and, in this case, it is necessary to analyze group relations through individuals and social networks to effectively control potential operational risks arising from various AI applications (Bresnahan et. al, 2002; McKinsey Institute, 2017; Bozkus Kahyaoglu, 2019; Susskind and Susskind, 2015). This is aimed to be solved with the responsible leadership approach that replaces the traditional management style of businesses.

It can be stated that an organization that internalizes ethical decision-making processes and does business according to corporate governance standards, ethical principles and values has a stronger brand image and competitive advantage. This is defined as the best practice and heavily discussed in the literature as technological change is not enough and the corporate culture must also change to adapt to digitalization and AI implementations (Westland, 2020). Priority is given to the establishment of the infrastructure of digital culture by changing and adapting the corporate culture.

Manyika et al. (2017a) claim that four factors are important in affecting the impact of technological innovation and AI implementations on future job growth, namely "economic factors", "the costs of technology", "labor market dynamics and skills", and "the regulatory and social acceptability of new technologies". It is a fact that each of these factors has the potential to speed up or slow down the adoption of a specific technological innovation and AI implementations which will impact on the number of jobs that will be lost or created in the future.

The point to note here is that AI is not perfect either. In the research, it has been determined that AI applications may tend to make non-objective decisions. This situation raises the concern that "AI biased" systems may trigger operational risks (Wodechi, 2019). A study has been initiated, especially within the EU (2020), to prevent problems arising from artificial intelligence applications and biased decisions. Because, if the algorithms do not produce the expected results, there may be additional risks for businesses, and may also lead to deviations from strategic goals.

Such a situation should be noted as the development that internal audit and risk assessment activities should take care of and follow. In essence, it works based on artificial intelligence algorithms and ensures the continuity of the system by producing its software autonomously.

If these self-reproducing algorithms produce biased information, all processes, sub-processes, and all decisions taken here may give erroneous results (Wodechi, 2019; Susskind and Susskind, 2015).

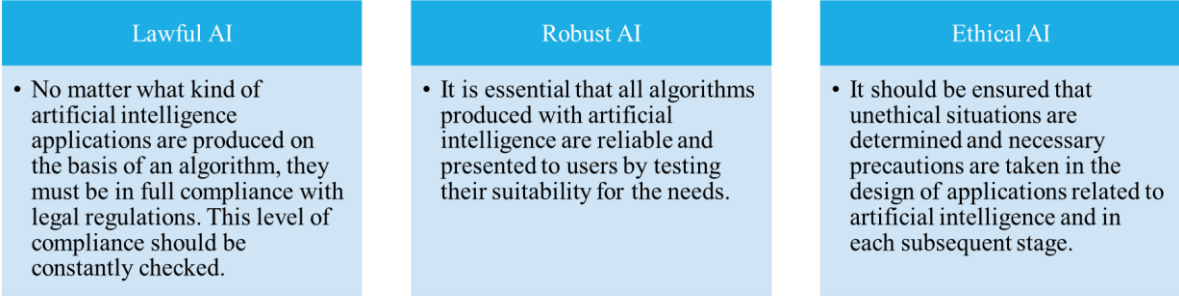


Figure 8.6. Explanations of Lawful, Ethical and Robust AI. Source: EU, 2020.

Based on the studies carried out by the EU, it is to eliminate the concerns arising in this direction and to provide the expected benefit from artificial intelligence without any malfunction. For this purpose, artificial intelligence has been handled in three dimensions and extensive studies are being conducted on it. These can be defined as the ethical dimension, legal dimension, and explanatory power (robust) dimension of artificial intelligence, respectively. The explanations of these three key dimensions of AI are given in Figure 8.6.

It is expected that the importance of ethics audits will increase especially among other key audit types. Ethics audits are the areas that are as important as financial audits in internal audit and risk assessment activities in the digital era. Hence, it is recommended to primarily audit, monitor and report ethical issues related to AI implementations (Bozkus Kahyaoglu et al, 2018).

8.4. New Tools and Techniques in Internal Audit and Risk Assessment Based on AI Practices

Along with AI implementations and digitalization, important changes are experienced in professions that include internal audit and risk assessment activities, as in all professions. Activities related to internal audit and risk assessment must develop their digital competencies so that they can offer reasonable assurance in line with international standards and stakeholders' needs and expectations (Rammoorti and Siegfried, 2016; RIMS, 2012; Westland, 2020). This situation is of great importance for internal audit departments not to question their reasons for existence and to protect their reputation within the organization.

In the digitalized audit universe, faster, agile, and flexible audits are required. Risk-based audit plans prepared for medium and long term with a traditional approach are no longer needed. It is necessary to carry out an audit and risk assessment with a structure that is constantly updated and rapidly adapts to changes in the digital control environment (Hedman and Kalling, 2003; Hinssen, 2010; Hess et al., 2016).

However, the job of internal auditors is not that easy. Because internal auditors can generally produce work depending on the maturity level of the organization they serve (Rajterič, 2010).

When the level of organizational maturity is low, internal audit should give priority to advisory activities in general and in this context guide management to strengthen the AI system infrastructure. In order to achieve this, they must constantly renew themselves in line with the due professional care based on IIA (2017) and RIMS (2012) standards.

With Industry 4.0, it is possible to express the development of audit tools and techniques that try to adapt to this as Audit 4.0 (Bozkus Kahyaoglu, 2019; KPMG, 2020; Westland, 2020). Accordingly, it is necessary to work on the use of advanced measurement techniques in audit field work and risk assessment and to report regularly and systematically to the management. Computer-aided audit techniques and tools include techniques, software, tools and instruments developed for more effective auditing and risk assessment in the context of artificial intelligence, machine language and the examination of all big data (Aksoy, 2006)

Among many new approaches and tools used in auditing and risk assessment, the major tools and techniques including big data analysis, artificial intelligence algorithms and CA/CM (Vasarhelyi and Halper, 1991; Vasarhelyi, 2002; Vasarhelyi et al., 2004; Vasarhelyi and Kuenkaikaew, 2010; Vasarhelyi et al., 2012; Bozkus Kahyaoglu et al. 2020) alert and early warning systems produced with robotic applications and anomaly detection are most frequently used. It should be noted that it is not enough to know these applications, since new tools and techniques are constantly changing (KPMG, 2013; KPMG, 2020). Therefore, internal audit and risk assessment professionals are expected to closely monitor such innovations and quickly integrate them into their business processes.

It should be taken into account that business processes are carried out in digital ecosystems, platforms and network structures through the virtual environment. In this context, possible cybersecurity issues should be included in the audit and risk assessment processes (Bozkus Kahyaoglu and Caliyurt, 2018; COSO, 2019). It should be kept in mind that some of the AI algorithms may contain malicious software leading to fraud cases.

Furthermore, according to the risk assessment component of the COSO internal control framework, the risks in the digital ecosystem, including digital fraud and corruption risks, are to be evaluated within the scope of all risks of the organization. All interested parties, including internal auditors, management and employees, should be aware of the assesment of these digital risks and know what to do when these risks arise (Aksoy and Saglam, 2020). For this reason, internal auditors and risk professionals should develop their digital skills to capture fraud cases that may affect their organizations through this channel.

8.5 Conclusion

It is a fact that science still relies on Euler and Einstein. The major reason for building up AI exponentially is the technology and data processing capabilities. Considering that AI applications appear in all areas of life; you can imagine how many different scenarios similar biases can be raised as operational risks arising from AI. For example, using historical data to inform decisions about whether a person will receive a mortgage, the type of health insurance coverage will be recommended, or just a visa application of a person approved or not, and the

long list goes on. Similarly, it is possible to add issues regarding many sectoral data analyses and criteria based on internal audit and risk assessment to this list.

In this new digital business world, it is important for professionals involved in internal audit and risk assessment to constantly update their digital competencies. It is also recommended that they add more ethics to audit plans than ever before. In the new digital world order, internal audit and risk assessment process owners have important duties to transform the developments emerging in the same environment into social benefits and added value.

In this chapter, the effects of AI on internal audit and risk assessment are discussed at macro, meso and micro levels. It should be noted that this new digital structure offers a virtual platform and network economy that radically impacts the work, the workplace, and the workforce. In this digital environment, traditional audit and risk assessment understanding, structure, mindset, culture, tools, and techniques will be insufficient. Therefore, the internal audit universe and risk universe should be updated with a perspective suitable for new approaches. Accordingly, an agile working style, in which digital audit and risk assessment tools and techniques, are used should be adopted.

The finally to be stated here is that artificial intelligence is not perfect at all. There may be some aspects of AI implementations that are open to improvement. Internal audit and risk assessment should be considered the most important and strategically positioned mechanism to detect these aspects open to improvement and to assess potential risks as early as possible. This will be the case, at least until the robots do this task.

References

- Aksoy, T., & Saglam, M. (2020). Examining the effects of internal control system on crisis management skills: The case of IMM fire service department. *International Journal of Research in Business and Social Science* (2147- 4478), 9(6), 274–288. <https://doi.org/10.20525/ijrbs.v9i6.922>
- Aksoy, T. (2006). *Denetim: AB ile Müzakere ve Uyum Sürecinde Denetimde Yeni Bir Paradigma*, Ankara: Yetkin Yayınları
- Andjelkovic, M. (2015). What Is the Digital Economy and Why Does It Matter? Background paper for the World Development Report 2016, World Bank, Washington, DC.
- Arner, D. W., Barberis, J. N., & Buckley, R. P. (2016). The Emergence Of Regtech 2.0: From Know Your Customer To Know Your Data, 44, *Journal Of Financial Transformation*, 79; *Unsw Law Research Paper*, No. 63.
- Bresnahan, T., Brynjolfsson, E.& Hitt, L.M. (2002). Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm-Level Evidence. *Quarterly Journal of Economics* 117 (1): 339–76.
- Bozkus Kahyaoglu, S. (2019). An Analysis on the Implementation of New Approaches and Techniques in the Auditing of Business Processes Based on Blockchain Technologies. *Cryptocurrencies in all aspects*. Editors. Darici, B. And F. Ayhan. Peterlang Publications.
- Bozkus Kahyaoglu, S., Sarıkaya, R.,& Topal, B . (2020). Continuous Auditing as a Strategic Tool in Public Sector Internal Audit: The Turkish Case. *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi*, 23 (1), 208-225 . DOI: 10.29249/selcuksbmyd.670261
- Bughin, J., Hazan,E., Lund, S., Daghstroem, P.,Wiesinger, A.& Subramaniam, A. (2018). Skills Shift: Automation and the Future of the Workforce. Discussion Paper; May McKinsey Global Institute.
- Buettner R. (2014) A framework for recommender systems in online social network recruiting. In: Proceedings of the 47th Hawaii international conference on system sciences (HICSS-47), Big Island, Hawaii, 1415–1424.
- Capitani, G. (2018). CIO's: Drivers or Followers of Digital Transformation? G. Bongiorno et al. (eds.), *CIOs and the Digital Transformation*, Springer. DOI 10.1007/978-3-319-31026-8_9.

- Commander, S., Rupert H., and Naercio Menezes-Filho. (2011). ICT and Productivity in Developing Countries: New Firm-Level Evidence from Brazil and India. *Review of Economics and Statistics* 93 (2): 528–41.
- COSO. (2019). Managing Cyber Risk in a Digital Age. <https://www.coso.org/Documents/COSO-Deloitte-Managing-Cyber-Risk-in-a-Digital-Age.pdf>
- EU (2020). Artificial intelligence-ethical and legal requirements. <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12527-Requirements-for-Artificial-Intelligence>
- Frey, Carl B. and Michael A. Osborne. (2013). *The Future of Employment: How Susceptible Are Jobs to Computerisation?* Oxford, U.K.: Oxford University.
- Hedman, J. and Kalling, T. (2003). The business model concept: Theoretical underpinnings and empirical illustrations. *European Journal of Information Systems*, 12, 49-59. DOI: 10.1057/palgrave.ejis.3000446.
- Hess, T., Matt, C., Benlian, A. and Wiesböck, F. (2016). Options for formulating a digital transformation strategy. *MIS Quart. Execut.*, 15, 151–173.
- Hinssen P. (2010). *The new Normal Explore the limits of the digital world.* Mac Media NV, Belgium. ISBN 978-9-081-32425-0.
- Institute of Internal Auditors-IIA (2017). *International Standards for The Professional Practice of Internal Auditing (Standards).* IPPF-Standards-2017.pdf (theiia.org)
- Ireland, R.D. and Webb, J.W. (2007). Strategic entrepreneurship: Creating competitive advantage through streams of innovation, *Business Horizons*, 50, 49-59.
- Johnson, M.W., Christensen, C.M. and Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review*, 86(12), 51-59.
- Kahyaoglu Bozkus, S. and Caliyurt, K. (2018). Cyber security assurance process from the internal audit perspective. *Managerial Auditing Journal*, 33(4), 360-376.
- KPMG. (2013). Taking the pulse. A survey of internal audit in singapore 2013. <https://assets.kpmg/content/dam/kpmg/sg/pdf/2016/09/sg-Audit-Internal-Audit-Survey-2013.pdf>
- KPMG (2020). 20 key risks to consider by Internal Audit before 2020 Are you aware of the risks concerning Internal Audit today and in the near future?. <https://assets.kpmg/content/dam/kpmg/ch/pdf/key-risks-internal-audit-2018.pdf>
- Kandeh, H. and Alsahli, M. (2020). Effect of Big Data Analytics on Audit An exploratory qualitative study of data analytics on auditors' skills and competence, perception of professional judgment, audit efficiency and audit quality. UMEA University, Department of Business Administration Master's Program in Accounting Master's Thesis in Business Administration III, 30 Credits, Spring Supervisor: Tobias Svanström.
- McKinsey Global Institute. (2017). Artificial Intelligence. The Next Digital Frontier? Discussion Paper. <https://www.mckinsey.com/~media/McKinsey/Industries/Advanced%20Electronics/Our%20Insights/How%20artificial%20intelligence%20can%20deliver%20real%20value%20to%20companies/MGI-Artificial-Intelligence-Discussion-paper.ashx>
- Messina, M. (2018). Designing the New Digital Innovation Environment. G. Bongiorno et al. (eds.), *CIOs and the Digital Transformation*, Springer. DOI 10.1007/978-3-319-31026-8_9.
- Manyika, J., M.Chui, M. Miremadi, J. Bughin, Katie George, Paul Willmott, and Martin Dewhurst. (2017a). *A Future That Works: Automation, Employment, And Productivity.* New York, NY: McKinsey & Company. <https://www.mckinsey.com/~media/mckinsey/featured%20insights/Digital%20Disruption/Harnessing%20automation%20for%20a%20future%20that%20works/MGI-A-future-that-works-Executivesummary.ashx>
- Manyika, James, Susan Lund, Michael Chui, Jacques Bughin, Jonathan Woetzel, Parul Batra, Ryan Ko, and Saurabh Sanghvi. (2017b). *Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages.* New York, NY: McKinsey & Company. <https://www.mckinsey.com/featuredinsights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-workwill-mean-for-jobs-skills-and-wages>
- LinkedIn (2019). Share of AI Talent Pool. Survey Report. www.Linkenedin.com

- OECD (2019). Going Digital: Shaping Policies, Improving Lives, OECD Publishing, Paris, <https://doi.org/10.1787/9789264312012-en>.
- Porter, M. E. and Heppelmann, J. E. (2015). How Smart, Connected Products are Transforming Companies. Harvard Business Review, 93 (10), 96-114.
- Rajterič, H. I. (2010). Overview of business intelligence maturity models. Management: Journal of Contemporary Management Issues, 15(1), 47-67. <https://hrcak.srce.hr/53606>
- Ramamoorti, S., and A. N. Siegfried. (2016). Promoting and Supporting Effective Organizational Governance. Internal Audit's Role. The Institute of Internal Auditors Research Foundation (IIARF). ID #2016-0423.
- Risk Management Society (RIMS) and Institute of Internal Auditors (IIA). (2012). Executive Report | Risk Management and Internal Audit: Forging a Collaborative Alliance. <https://global.theia.org/standards-guidance/Public%20Documents/RIMS%20and%20The%20IIA%20Executive%20Report%20Forging%20a%20Collaborative%20Alliance.pdf>
- Sambamurthy, V. and R. W. Zmud. (2017). Guiding the Digital Transformation of Organizations- Second Edition, Legerity Digital Press LLC, ISBN 978-0-9995347-0-0.
- Strafford, H. (2018). The Future of Work and the GIG Economy. The College of the Siskiyous. The Future of Work & The GIG Economy - Rural (slideshare.net)
- Susskind, R. and D., Susskind (2015). The Future Of The Professions- how technology will transform the work of human experts. Oxford University Press. ISBN 978-0-19-871339-5.
- Turing, A. M. (1950) Computing Machinery and Intelligence. In B. J. Copeland, ed., The Essential Turing. Oxford University Press, 2004.
- Vasarhelyi M.A., Halper F.B. (1991). The continuous audit of online systems. A Journal of Practice & Theory, 1991;10(1):110-25. https://www.researchgate.net/profile/Miklos_Vasarhelyi/publication/255667612_The_Continuous_Audit_of_Online_Systems/links/5410341a0cf2f2b29a3f4fbf/The-Continuous-Audit-of-OnlineSystems.pdf?origin=publication_detail
- Vasarhelyi, M. A. (2002). Concepts in continuous assurance. In S. Sutton & V. Arnold (Eds.), Researching accounting as an information systems discipline. Sarasota, FL: American Accounting Association
- Vasarhelyi Miklos A., M.G. Alles, and A.Kogan (2004). Principles of Analytic Monitoring for Continuous Assurance. Journal of Emerging Technologies in Accounting, December 2004, Vol. 1, No. 1, pp. 1-21.
- Vasarhelyi MA, Kuenkaikaew S. (2010). "Continuous auditing and continuous control monitoring: case studies from leading organizations": Rutgers Business School, Rutgers Accounting Research Center; 2010.
- Vasarhelyi, M. A., Alles, M. G., Kuenkaikaew, S., and Littlely, J. (2012) "The acceptance and adoption of continuous auditing by internal auditors: A micro analysis". International Journal of Accounting Information Systems, 13(3), pp. 267-281.
- Vasarhelyi, M. A., et al. (2015). "Big Data in Accounting: An Overview." Accounting Horizons 29(2): 381-396
- Westland J. C. (2020). Audit Analytics. Data Science for the Accounting Profession. Springer Publications. ISBN 978-3-030-49091-1.
- Wilson H. J., Daugherty, P. R. and Morini-Bianzino, N. (2017). The Jobs that Artificial Intelligence will Create. MIT Sloan Management Review. Summer.
- Wodechi, A. (2019). Artificial Intelligence in Value Creation Improving Competitive Advantage. This Palgrave Macmillan. ISBN 978-3-319-91595-1
- World Economic Forum (2018). Global Gender Gap Report. ISBN-13: 978-2-940631-00-1.
- Wikipedia (2020). List of top 10 companies with the largest market capitalization. https://en.wikipedia.org/wiki/List_of_public_corporations_by_market_capitalization