Chapter 17

Artificial Intelligence in Computer-Aided Auditing Techniques and Technologies (CAATTs) and an Application Proposal for Auditors

Tamer Aksoy[1], Burcu Gurol[2]

Abstract Digital transformation is the modification resulting from new opportunities technological advancements in all areas of life presents. These new technologies are also used in audit activities. These new technologies used in audit activities are called Computer Assisted Auditing Techniques and Technologies (CAATTs). Those have emerged to help auditors look for irregularities in data files and to enable more analyses to be done in less time with more evidence at a lower risk level. By using CAATTs, the auditor is able to filter, define and create equations, identify gaps, make statistical analysis, identify peer records, classify, sort, summarize, merge, and match. The fact that the auditor reaches the results by analyzing the sample chosen in the audit activities may cause the concerned parties to approach these results with suspicion. Instead of selecting and analyzing samples, using CAATTs, the auditor may also analyze the entire data. Concurrent with new technological developments, the scope of CAATTs applications is also advancing. Artificial Intelligence(AI), as an automated system that can generate algorithms, occupies a center stage in these developments. It is observed that 4 concepts are emphasized for AI. These concepts are acting like human, thinking like human, rational thinking, and rational behavior. These factors facilitated the inclusion of AI in audit activities. The emergence of AI will include human-like activities in the auditing process. In general, it is considered that the technology applied to the audit allows the activities to be carried out more effectively. In reality, there are contradictions about the use of AI in audit activities. Some researchers support the use of this new technology in the auditing process, while others are skeptical. Those, who view the use of AI with skepticism, state that the professional judgment of the auditor can be ignored with the utilization of AI. For this reason, how to limit the use of AI in audit activities is discussed. Firstly, the study explains CAATTs applications and the concept of AI and how AI is included in accounting and auditing activities. Secondly, the advantages and disadvantages of using AI in the auditing processes are evaluated. Lastly, the use of AI and CAATTs in audit process and specific application suggestions for different audit areas are discussed in detail in the context of suggested audit batches.

Key Words: Auditing, Computer-Aided Auditing Technologies, Artificial Intelligence

[1] Tamer Aksoy
School of Business
Ibn Haldun University,
Istanbul, Turkey
E-mail: tameraksoy1965@gmail.com
tamer.aksoy@ihu.edu.tr
ORCID: 0000-0001-6483-4547

[2] Burcu Gurol (Corresponding Author)
Department of Finance and Banking
Baskent University,
Ankara, Turkey
E-mail: bgurol@baskent.edu.tr
ORCID: 0000-0001-9974-2351

17. 1 Introduction

Digital transformation is the change generated by new technological opportunities affecting all areas of life. These technologies, which were primarily used in business activities in the field of industry, were also adopted in the accounting function of the enterprise. Hence traditional accounting practices were abandoned. In parallel with accounting activities, new technologies are used in auditing. These new technologies used in audit activities are called Computer-Assisted Auditing Tools and Techniques (CAATTs).

These tools and techniques have emerged to help auditors look for irregularities in data files and to enable more analyses to be done in less time with more evidence at a lower risk level (Pedrosa & Costa, 2012, 161-168). By using these tools and techniques, the auditor is able to filter, define and create equations, identify gaps, make statistical analysis, identify peer records, classify, sort, summarize, merge, and match (Boydaş Hazar, 2019, 117 -139).

The fact that the auditor reaches the results by analyzing the sample chosen in the audit activities may cause the concerned parties to approach these results with suspicion (Brazina & Leauby, 2004, 24-27). Instead of selecting and analyzing samples, using CAATTs, the auditor may also analyze all the data. Thus, the reliability of the auditor's opinion will increase with the related parties.

Along with new developments in technology, the scope of CAATTs applications is developing. One of the technologies that is expected to contribute the most to CAATTs is Artificial Intelligence. Artificial Intelligence, as an automated system that can generate algorithms, has an important place in these developments. Artificial Intelligence (AI) is not a single technology, but a set of methods and tools applied to countless situations across subdomains (EY, 2019).

Four concepts are emphasized in the definitions of AI. These concepts are: acting like a human, thinking like a human, rational thinking, and rational behavior. These factors facilitated the inclusion of artificial intelligence in audit activities. The emergence of artificial intelligence will include human-like activities in the auditing process.

In general, it is considered that the technology applied to the audit allows the activities to be carried out more effectively. In reality, there are contradictions about the use of artificial intelligence in audit activities. Some researchers support the use of this new technology in the auditing process, while others are skeptical of these developments. Those, who suspect the use of artificial intelligence with skepticism, state that the professional judgment of the auditor can be ignored with artificial intelligence practices. For this reason, how to limit the use of artificial intelligence in audit activities is discussed.

In this study, firstly, CAATTs applications and the concept of artificial intelligence and how artificial intelligence is included in accounting and auditing activities are explained. Secondly, the advantages and disadvantages of using artificial intelligence in the auditing processes are evaluated. Lastly, the use of AI and CATTs in audit process and specific application suggestions for different audit areas are discussed in detail in the context of audit batches.

17.2 Digitalization in Audit

Digital transformation refers to the alteration affecting our lives with developing technologies. This transformation has been visible in the field of industry with the advantages it provides. Increasing efficiency and decreasing costs are the most important of these advantages.

This rapid change is represented by 4 periods in relation to the developments in the process after the Industrial Revolution.

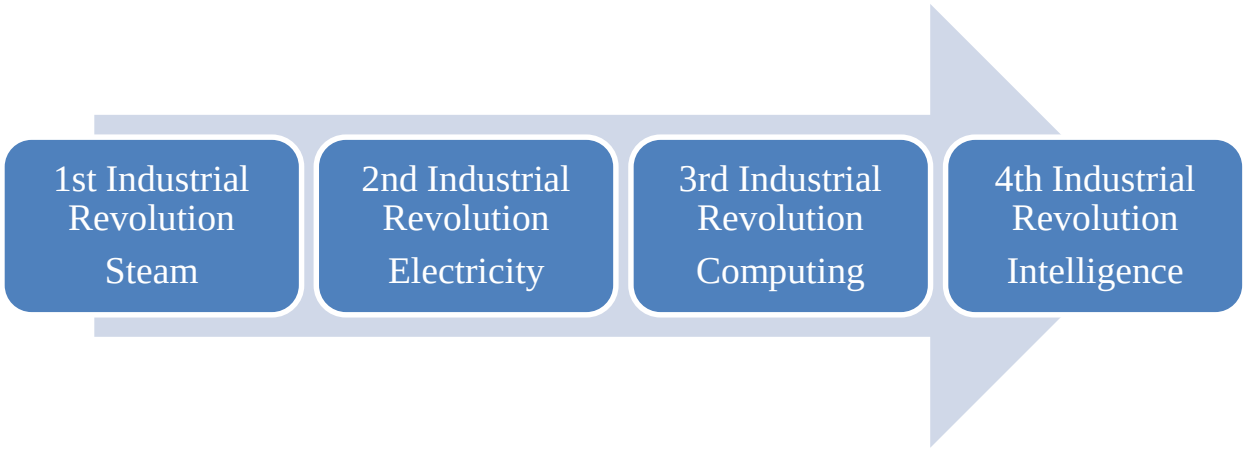

Figure 17.1 Industrial Revolution

Source: The figure formed by authors

As seen in Figure 17.1, there was a new concept that changed the industry in each period. The use of steam machines in the 1st industrial revolution, the use of electricity in production in the 2nd industrial revolution, computers contributed to the industry in the 3rd industrial revolution. “Intelligence” stands out as it represents a crucial technological turn about within the industry.

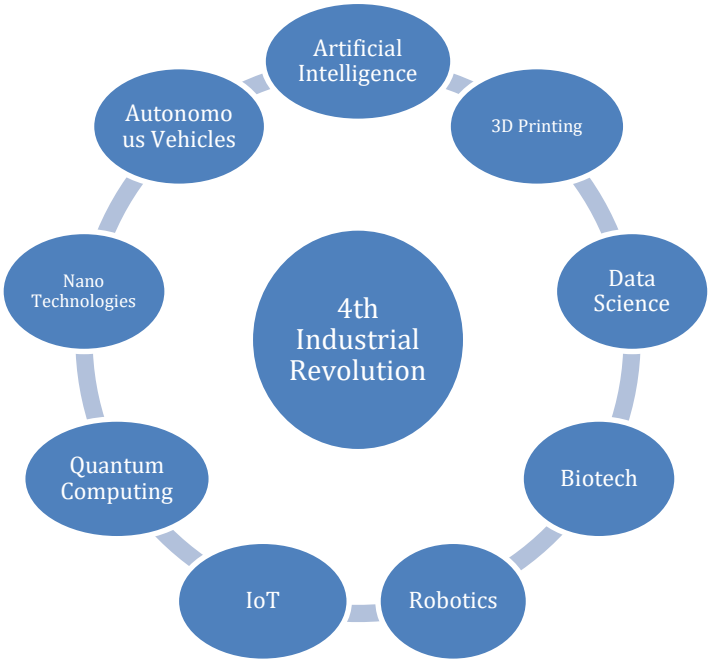

Figure 17.2 Technologies of 4th Industry Revolution

Source: The figure formed by authors

The technologies shown in Figure 17.2 are not only important for industry, but also for other business activities. Marketing and distribution, human resources, accounting and finance are examples of these activities. In terms of accounting, it is seen that digitalization, which started with computerized accounting applications in the 1990s, changed very rapidly with these new technologies. The old practices of accounting were abandoned. Accounting practices of businesses started to be done with accounting programs prepared with these technologies.

With these developments in accounting old audit techniques have been replaced by new audit applications. Considering the developments in the field of auditing, audit activities are also divided into terms.

Figure 17.3 Revolution of Auditing, Source: (Dai & Vasarhelyi, 2016)

As seen in Figure 3, there are four important periods in the development of audit. The first step of digitalization in audit is the use excel program in audit activities. In Audit 1.0, auditors were manually auditing the accounting records. Later audit activities started using computers. Excel and CAATTs were instruments of Audit 2.0. Audit 3.0 included analytical applications in the process of auditing.

Audit 4.0 shows that it is quite different from other periods. The important effect in the formation of Audit 4.0 can be attributed to 4th Industry Revolution. Integrated Audit Software and new CAATTs, which have been implemented thanks to the components of 4th Industrial Revolution, have increased the reliability of audit results, shorten the time spend for audit and reduced cost. In today's world, the audit processes are changing with the inclusion of new technologies in CAATTs applications. New techniques and technologies can assist auditors and provides unlimited potential for auditing process (Issa, Sun, & Vasarhelyi, 2016).

17.3 Audit Softwares

The 3 audit softwares are frequently used in audit activities. These are programs currently used by entities, and support programs, general audit software and special audit software.

17.3.1 Programs Currently Used by Entities, and Support Programs

General application programs (not for auditing) or computer control capabilities (such as querying possibilities, sorting, reviewing, and printing) included in the software used by a company assists in the implementation of common data processing. However, as mentioned above, these programs are not specifically designed for use in audit activities and their usage in audit practices is very limited. These kinds of programs usually allow the operations that can be done manually in a long time to be done in a shorter time.

17.3.2 General Audit Software

This software consists of computer package programs designed to enable various computing activities to be carried out for audit purposes. These activities include reading the files, selecting and obtaining the desired information and/or sampling, making various calculations, making comparisons between the account items, and obtaining the desired reports.

17.3.3 Special Audit Software

Special audit software is program specially designed to carry out audits in specific situations related to certain assets of the organization. These programs can be prepared by the auditor or programmers from outside the organization. Large audit firms have their audit software. However, these programs generally need to be modified according to the customer's operating system. Although special audit software is useful for companies in certain sectors, it also contains some drawbacks. An example of these drawbacks is that the cost of such software is high and in some cases requires expertise above the level of technical knowledge of the auditor. When developing special audit software, the auditor should take part in all the design and testing phases related to this software and ensure that the program is designed to meet their needs and demands. Auditing software is important for the auditor in maintaining the activities effectively and efficiently in an enterprise where the computer is used extensively.

The management or IT department of the audited entity may object to the use of such software because it will disrupt normal computing activities. However, due to costs, time, and labor constraints, it is often impossible to manually control activities in such computer-intensive businesses. If we look at the issue in terms of external audit. If the business prevents the use of audit software, then the auditor may consider this as a limitation in terms of scope, and may even give a conditional opinion in report. According to another classification, there are three types of software that are widely used in CAATTs (Coderre , 2009):

- Common use office software (Microsoft Word, Excel, internet, e-mail.)
- Technical software prepared for inquiries, analysis, auditing and security purposes can be used as an audit tool
- Special audit software prepared for auditors (ACL, inCup etc.)

17.4 Artificial Intelligence (AI)

Artificial Intelligence as one of the components of the 4th Industry Revolution is software systems with many abilities such as human behavior, numerical logic, speech, and sound perception. According to Wirth (2018), Artificial Intelligence is the last big game-changer. Fredkin explains Artificial Intelligence even more assertively. In the famous book of MIT Press "Mechanical Bodies Computational Minds: Artificial Intelligence from Automata to Cyborgs" the importance of Artificial Intelligence is explains with Fredkin's words (Franchi & Güzeldere, 2005): "*There are three great events in history. One is the creation of the universe. Two is the appearance of life. The third one, which I think is equally important, is appearance of Artificial Intelligence".*

Artificial Intelligence as a revolutionary technology makes computers behave like a human (Issa, Sun, & Vasarhelyi, 2016). As an example, Artificial Intelligence responds by choosing the most appropriate one from the answers to the questions asked. Apple Siri, Google Now as well-known Artificial Intelligence examples can assist user like a real assistant. In today's world, Artificial Intelligence is part of our lives more than just a software that behaves like human. Artificial Intelligence can perform better than people when the job is complex and needs to analyze large amounts of data. According to OECD, Artificial Intelligence can be used in solving problems such as climate changes, diseases and famine (OECD, 2019) and can be a key for increasing social welfare. Some applications of Artificial Intelligence are (Nilsson, 1993);

-Natural language processing
- Image processing
- Intelligent retrieval from databases
- Expert consulting systems
- Theorem Proving
- Robotics
- Automatic Programming
- Combinatorial and scheduling problems
- Perception problem

Artificial Intelligence can be examined under 3 headings (Wirth, 2018):

Weak/Narrow Artificial Intelligence are software prepared to perform a certain task. They can not go out of their fields. They are just the simulation of human behavior in an area. Hybrid Artificial Intelligence occurs when more than one narrow Artificial Intelligence comes together

(Greenwald, 2011). So, they are more capable than weak/narrow Artificial Intelligence. Strong Artificial Intelligence has the flexibility of human intelligence. They can make decisions independently. They have their own mind.

17.4.1 The History of AI

The foundations of artificial intelligence go back to the 17th century. French mathematician Blaise Pascal built a calculator in 1642. In 1837 the first programmable machine was made by Charles Babage and Ada Lovelage. Warren Mc Culloch and Walter Pitts did the first study to link machines and brain in 1943. Alan Turing asked the most important question in history of Artificial Intelligence in 1950 : Can machines learn? Although it was strange when asked, the question was later caught in the mind of other researchers. The term of "Artificial Intelligence" was first used by John McCarthy in 1956. From 1950's to the middle of 1980's first intelligent machines were appeared. One of the famous examples of this period is Eliza, a natural language program, created in 1965. Edward Feigenbaum creates expert systems for decision making process in 1980s (qbi, 2019).

In 1997, a computer in a chess game defeated Kasparov. When looking at the first application of Artificial Intelligence, developed by IBM, all possible movements related to a checkers play were programmed into the algorithm. This weak/narrow Artificial Intelligence was able to choose the most suitable movement according to the situation (Bini, 2018).

From the middle of 1980's to 2010's there was a transition from programmed artificial intelligence applications to machines capable of learning by using data and Artificial Intelligence techniques. Autonomous vacuum cleaner i-robot Roomba (2002) Google's the first self-driving car (2009) are important examples of this term.

In 2011 IBM Watson defeats champions of a risk game. Similarly AlphaGo beat Lee Sedol in 2016.

17.4.2 The Relationship Between Artificial Intelligence, Machine Learning and Deep Learning

Today, artificial intelligence, machine learning and deep learning are concepts used together. However, these concepts differ from each other.

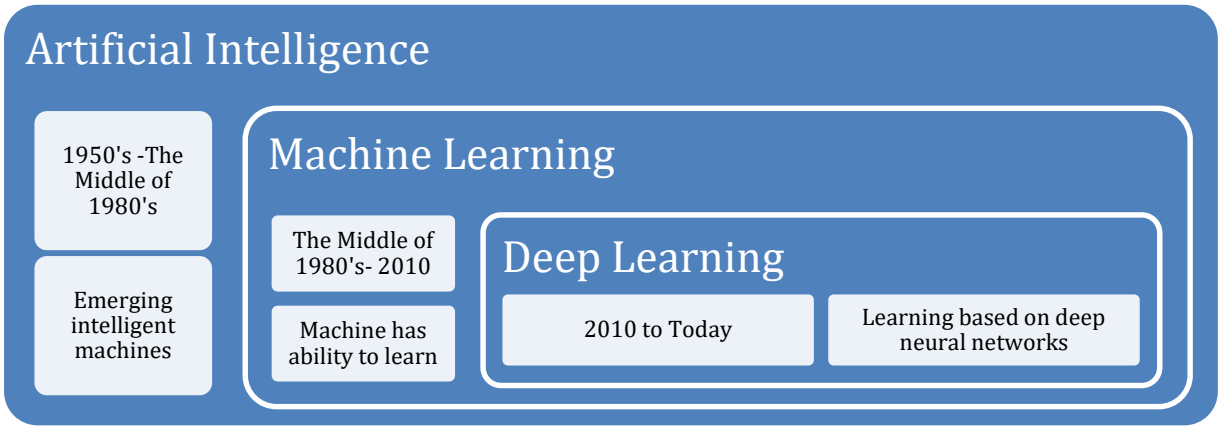

Figure 17.4 Artificial Intelligence, Machine Learning and Deep Learning, Source: The figure formed by authors

Machine Learning is located in the estimates of mathematical and statistical operations with making inferences based on the data system modeled with computers. The first invention of machines capable of learning was in 1980s.

Deep Learning applications were appeared in the 2010's as a subset of Machine Learning and Artificial Intelligence. Differently from Artificial Intelligence and Machine Learning, Deep Learning is based on deep neural networks. Automated driving and hearing and speech translation are well-known example of deep learning.

While Artificial Intelligence developed in this way, data science was included in artificial intelligence applications. Data Science can help decision process by providing a wide perspective. Data Science is linked to data mining and big data.

Financial information is recorded, classified, reported, and analyzed in the accounting information system. For this reason, accounting systems generate big data. Data science can be used to analyze the data in accounting process. When artificial intelligence and data science come together, the analysis of this information and the interpretation of the analysis results can be done by this new software. Not only data from accounting information system but also other parts of business can produce data that can be used by auditors.

17.4.3 Advantages and Disadvantages of AI

Artificial Intelligence application worries people as much as it excites. While successful results are expected from artificial intelligence applications, it is thought that these applications may also lead to harmful results.

The main advantages of AI are (Hcltech, 2020):

- Artificial Intelligence reduces the time taken to perform a task. It allows multiple jobs to be carried out simultaneously. Thus, existing resources are used more efficiently.
- Artificial Intelligence ensures that complex tasks have been done so far without incurring huge costs.
- Artificial intelligence has no working time limit. It operates 24x7 without interruption and has no downtime.
- AI makes the process faster and smarter, making decision making easier.

The main disadvantages of AI are:

- AI applications require very high costs.
- It will take time for artificial intelligence to contribute to processes like a human.
- It is not possible for artificial intelligence to achieve the consciousness and flexibility of the person through experience.
- The abilities of artificial intelligence are limited to the abilities of the designer.
- Increased artificial intelligence practices can cause unemployment.

17.4.4 Control of Artificial Intelligence

Expectations from Artificial Intelligence are high and new Artificial Intelligence applications also increase this expectation day by day. Although the aim is to get better results in a shorter time with artificial intelligence, it is possible for artificial intelligence to go beyond its purpose. For this reason, the control and audit of artificial intelligence is an important issue. According to Paul Barba, to achieve successful results with artificial intelligence, artificial intelligence should be designed with transparency and accountability. He also makes 4 suggestions (Barba, 2018):

- Build Transparent System: How the artificial intelligence application works and how it decides should be presented with transparency.
- Use Best Practices: Benefit from best practices when building the system and then watching the system
- Reduce Risk: Try to minimize the risk level to potential problems caused by artificial intelligence.
- Do Experiments: Try to find vulnerabilities of Artificial Intelligence system.

17.4.5 OECD Artificial Intelligence Principles

Seeing the potential of Artificial Intelligence, OECD has determined principles in May 2019. OECD Artificial Intelligence Principles are the first standards that accepted internationally. The purpose of establishing principles is to ensure the reliable use of Artificial Intelligence. Because Artificial Intelligence can be used in accordance with human rights and democratic values or can be used deliberately for malicious purposes. Although they are not OECD members, Argentina, Brazil, Costa Rica, Malta, Peru, Romania and Ukraine have adopted the OECD AI principles. (OECD, 2019).

OECD has determined 5 principles regarding to Artificial Intelligence:

> *"**Principle 1.** AI should benefit people and the planet by driving inclusive growth, sustainable development, and well-being.*
>
> ***Principle 2.** AI systems should be designed in a way that respects the rule of law, human rights, democratic values and diversity, and they should include appropriate safeguards – for example, enabling human intervention where necessary – to ensure a fair and just society.*
>
> ***Principle 3.** There should be transparency and responsible disclosure around AI systems to ensure that people understand AI-based outcomes and can challenge them.*
>
> ***Principle 4.** AI systems must function in a robust, secure, and safe way throughout their life cycles and potential risks should be continually assessed and managed.*
>
> ***Principle 5.** Organizations and individuals developing, deploying, or operating AI systems should be held accountable for their proper functioning in line with the above principles."*

Addition to these 5 principles OECD also has offered governments recommendations:

- *"Facilitate public and private investment in research & development to spur innovation in trustworthy AI.*
- *Foster accessible AI ecosystems with digital infrastructure and technologies and mechanisms to share data and knowledge.*
- *Ensure a policy environment that will open the way to deployment of trustworthy AI systems.*
- *Empower people with the skills for AI and support workers for a fair transition.*
- *Co-operate across borders and sectors to progress on responsible stewardship of trustworthy AI."*

17.5 New Technologies in Auditing

Digital transformation has changed the audit activities as in all areas of life. Manual auditing practices were abandoned. This also applies to auditing. The most important reason that triggers the use of new technologies in auditing is the use of these new techniques in accounting practices. In an environment where accounting practices are carried out with new technologies, it is not possible to perform audit activities manually.

According to Curtis and Payne auditors lags behind businesses using new technologies (Curtis & Payne, 2008, s. 104-121). Liu and Vasarhelyi attributes this to the conservative attitudes of the auditors (Liu & Vasarhelyi, 2014, s. 1-27).

The fact that the auditors continue to use traditional audit methods by ignoring the technological possibilities used by the businesses they provide consultancy or audit services will cause question marks about the reliability of the audit results. At the World Economic Forum, the results of a study conducted on which occupational developments affect technological developments were shared and it was stated that those who work in accounting are among the groups most affected by these developments (Schwab & Samans, 2016).

Effective implementation of new technologies can make an important contribution to audit activities. Omoteso listed the contributions of Artificial Intelligence to auditing process below (Omoteso, 2012):

- ***Efficiency and effectiveness*** (Abdolmohammadi & Usoff, 2001).
  Much more data can be audited in much less time with Artificial Intelligence. The audit that has done manually in the past is faster with word processors today. Performing data analysis significantly shortens the time per audit. The issues that cannot be revealed with the existing system outputs and reports can be determined by data analysis. This is an important tool in combating irregular practices and fraud. While defrauders prefer the methods they believe will not be seen in the existing systems and reporting; It is possible to detect irregularities by following different methods with data analysis. Data analysis allows for full analysis instead of sampling in many cases.

- ***Consistence, advanced decision making process*** (Brown & Murphy, 1990)

  It is possible to analyze high volumes of data that can be completed in a long time by other methods, in a short time with CAATTs. All data can be examined without the need for sampling. It can be repeated easily without damaging the original data, allows for permanent monitoring, is open to the use of different parameters. It allows the use of some auxiliary audit tools, such as various statistical information and control of all data

and calculations that would not be seen as efficient in normal auditing. It provides additional tools that allow testing the accuracy of the data, revealing statistical data, trends, abnormalities, exceptions (other than existing ones). It is effective in detecting corruption as it produces analyzes, classifications, statistics, briefly reports apart from normal computing reporting.

- ***Saving Time***

  It saves the auditor from repetitive, boring workload. It helps identify potential risk points; provides support to the audit through tools such as additional information, statistics etc. that are easily accessible. The use of data analysis methods allows for continuous observation (Eining & Dorr, 1991). It offers modern control opportunities to prevent errors and corruption by continuously monitoring them. As a natural result of all this, audit costs are reduced.

- ***Created Added Value And Producing Information***

  Producing new information that can be utilized by making analysis instead of just the externally viewing and critical control structure; turns it into an activity that creates added value. For example, it reveals revenue losses and waste of resources, creates results that will support the decisions to be taken by the management, has a preventive and corruption-prone structure.

- ***Creates New Audit Areas***

  Areas that do not have records on paper, for example, many e-commerce records are known as log files, network entries and exits, internet, mail, file transfer, personnel entries and exits, telephone records, production-storage-shipping results and times, provides inspection in the field. To give an example to this issue; businesses are aware of a hacker who steals their information or damages their websites only after this person "does what they do". However, it has been determined that hacking is a long process. Accordingly, the hacker makes many preparations before doing the damaging action. The important thing is to perceive that a hacker is dealing with you in time and take precautions; this is only possible with regular analysis of log records.

- ***Increased Reputation of the Audit Unit***

  When the above-mentioned advantages are used, the reputation and credibility of the audit unit increases. It has been observed that issues positively affect the image of the audit units in the long run such as shortening of the time allocated per audit, increased efficiency and cost reduction, and preventive audit practices.

This is used by audit firms to support audit planning, compliance testing, critical testing, risk assessment and decision-making, especially the Big 4 (Issa, Sun, & Vasarhelyi, 2016). Big 4 can meet the high costs required by artificial intelligence. For this reason they lead innovations.

In 2018 KPMG announced that it is using Artificial Intelligence applications prepared by IBM (KPMG, 2018). E&Y has been using a software that models human behaviour. PwC has been using "DeNova" that is a sample of Artificial Intelligence for auditing operations. Deloitte is working to add machine learning to its activities with Google (Deloitte, 2019).

In the International Training Proceedings Handbook published by the International Federation of Accountants (IFAC), the following information is given about the training to be given to the candidate auditors (IFAC 2010):

- The scope of some elements of computer-based business systems should be integrated into financial accounting courses.

- The scope of internal control elements in the computer environment should be integrated into the audit lesson.

- Candidate auditors should be able to explain, define, or discuss the physical and hardware elements of a system.

Among the new technologies, the technologies that excite the auditing industry most are the Artificial Intelligence and Data Science. While both applications are expected to contribute positively to the audit activities, there are also hesitations regarding the use of artificial intelligence in the audit activities.

17.6 Usages of CAATTs

CAATTs are widely used in audit processes for two purposes, testing and integrated data testing technique as below.

17.6.1 Testing

This technique was created specifically to test the reliability of internal control systems that developed within the organization's computer programs. It is conformance. With this technique, information is entered into the data processing system for testing purposes and this information is processed and compared to predefined results. The data to be entered into the system for testing purposes should be as much as possible, containing all kinds of processes carried out by the system and all kinds of possible errors that may occur accordingly.

These processes and errors are designed to determine if programmed processes are working effectively. (For example, to check whether transaction dates and quantities other than specified parameters are accepted and whether exceptional reports are created for appropriate cases.) The test technique is generally easy to use. The auditor does not need to have advanced knowledge of computer processes. However, the normal flow of information of the company audited can be completed, without little or no interruption.

The auditor may test the entity's internal control system during the audit process; however, the auditor is not sure whether these controls have been effectively applied, at times other than the auditing process.

17.6.2 Integrated Data Testing Technique

Because the testing technique is restricted to the audit process, the auditor can not apply this technique in processes other than the audit of the business. The scope of the data testing technique is extended with the "Integrated Testing Data" technique to overcome this problem. In the application of this technique, primarily imaginary units that reflect the structure of the

company, employees, and other units related to audit controls are created. Later, counterfeit transactions related to these units are located among the normal operations of the organization and taken into monitoring. Then, the results of these counterfeit units are compared with the predetermined results. If the integrated data testing technique is used, the auditor does not have to test the entire computer system of the audited company. It should not forget the fact that the real files of the business can be damaged due to the use of this technique. Therefore, the auditor should carefully withdraw all counterfeit data from the system after the audit, without damaging other records.

17.7 Basic Functions That Can Be Performed with Special CAATTs Software (ACL Example)

Before sitting at the CAATTs on the computer, all you have to do is decide "what to do, what you want to achieve, and what results you want to achieve". After this decision is taken, the opportunities provided by the analysis of the auditors are as follows:

Counting

One of the operations that can be done with the audit software is counting. When hundreds, millions of inventory, numbers, and explanatory notes are listed, it is clear that counting for this volume of data will not be easy. However, in programs such as Excel and ACL, counting of this data can be completed in a few seconds.

Collection

In addition to the normal totals, for example, to calculate the value of the goods in warehouse 5, the sum of the goods "5" in the "warehouse number" column can be taken. These simple-looking operations save considerable time when working with large stacks of data.

Recalculation

For example; it is possible to report the differences by recalculating the amounts of interest, depreciation, revaluation etc.

Preparing Statistics

As an example of these functions, it is possible to determine the abnormal ones to be determined according to the audit objectives from the data you have, determining the negative-positive or zero balance percentages, averaging, determining the highest or lowest 10 items, layering, etc. elements can be given. Thus, trends, exceptions and potential audit areas with risk are identified. In software created for audit purposes such as ACL, it is possible to reach statistics with a single click. [6]

Classification

Classification of information about period-end assets on each warehouse basis or under certain commodity groups can be given as examples to these functions.

Aging - Date Analysis

All kinds of date range calculations, delayed transactions, classification according to certain day intervals, are examples of aging processes.

Filtering

It is one of the functions most used by the auditor. Operations such as listing only certain places or types of goods from the period-end inventory list, listing goods that give negative balance in the inventory, and tracking invalid or missing data are examples of this function.

Sequence Command

Invoice, voucher, receipt, etc. whether the numbers follow the sequence; that is, the gap-duplicate search function is an example.

Sorting

Sorting by size, date, or letter, sorting sales by gross profitability rates are examples of this function.

Summarizing

It is effective in summarizing huge tables with many rows and columns. As an example of summarizing function, numerical totals for each field can be taken and creating a special table by using this function.

Verification

It is possible to verify by comparing the data with other data. Efficiency can be increased especially by comparing the data in different files or fields. For example, purchasing data and accounting data can be compared.

Identifying Duplicate Information Entries

Through this special software, researches can be conducted to determine any kind of duplicate record, payment, name, account, address among the auditor mass data.
The features summarized above are ready control functions in the ACL special software in question, like examples such as the square root button on calculators. It gives the result of selecting the number and pressing that key.

17.8 Artificial Intelligence in Computer-Assisted Auditing Tools and Techniques

Computer-Assisted Auditing Tools and Techniques (CAATTs) are improving day by day with the integration of computer technologies into audit activities. CAATTs have emerged to help auditors look for irregularities in data files, to enable more analysis to be done in less time (Mohamed, Muhayyidin, & Rozzani, 2019, s. 35-50). Using these tools and techniques, the auditor can filter, define and create equations, identify gaps, make statistical analysis, identify peer records, classify, sort, summarize, layer, merge, match (Boydaş Hazar, 2019, s. 117-139).

CAATTs can be used in internal and external audit activities. The internal auditor can analyze the data ranging from the accounting records of the business to the camera records with

CAATTs supported by artificial intelligence to detect errors and fraud. Although the external auditor does not have a data set as large as the internal auditor, it can perform a comprehensive analysis with CAATTs by taking all the financial data of previous years.

The purpose of the auditor is to express an opinion on whether the financial statements prepared by the entity comply with the predetermined standards. The auditor needs to gather sufficient evidence to establish this opinion. With CAATTs powered by artificial intelligence, the auditor can easily gather evidence. With artificial intelligence, the entire data population can be analyzed, and finding evidence is not left to chance. All outliers and exceptions are easily accessible. If the scope of the data available to the auditor is expanded, data such as e-mails and social media shares can be used in the audit process. Contracts can be examined with a capacity far above human capacity (EY, 2019).

In order to ensure the standardization of the audit activities and to increase the audit quality, the International Standard on Auditing texts created by IFAC contains provisions regarding the use of CAATTs.

> *ISA 240: Physical observation or inspection of certain assets may become more important or the auditor may choose to use computer-assisted audit techniques to gather more evidence about data contained in significant accounts or electronic transaction files* (ISA240, 2010).
>
> *ISA 315: The use of computer-assisted audit techniques (CAATTs) may enable more extensive testing of electronic transactions and account files, which may be useful when the auditor decides to modify the extent of testing, for example, in responding to the risks of material misstatement due to fraud. Such techniques can be used to select sample transactions from key electronic files, to sort transactions with specific characteristics, or to test an entire population instead of a sample* (ISA315, 2019).
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> *ISA 330: The use of computer-assisted audit techniques (CAATTs) may enable more extensive testing of electronic transactions and account files, which may be useful when the auditor decides to modify the extent of testing, for example, in responding to the risks of material misstatement due to fraud. Such techniques can be used to select sample transactions from key electronic files, to sort transactions with specific characteristics, or to test an entire population instead of a sample* (ISA330, 2010).
>
> *ISA 550: Conducting an analysis of accounting records for transactions with the newly identified related parties. Such an analysis may be facilitated using computer-assisted audit techniques* (ISA550, 2010).

17.8.1 Auditing Risk and Artificial Intelligence

Risk is as important in auditing as in many other issues. For the auditor, risk is audit risk. Audit risk is that the auditor obtained an incorrect result at the end of the audit process. Risk always exists and the auditor is expected to keep this risk to a minimum.

The auditor identifies important areas to minimize risk and shows more attention to these areas during the audit process. When determining important areas, there are restrictions for the auditor such as the capacity of the audit team to do business and the duration of the audit. Artificial Intelligence and machine learning can be used to determine important areas (Raphael,

2015). As artificial intelligence and machine learning provide the opportunity to analyze all data in a short time, the auditor can get rid of these restrictions.

With CAATTs applications enriched with artificial intelligence and machine learning applications, it will be easier to resist possible risks and to update the determined important areas according to the development of the audit process.

17.8.2 Concerns about Using Artificial Intelligence in Auditing

The capacities of artificial intelligence applications create both excitement and suspicion. In addition to preventing the malicious use of artificial intelligence, it is an important issue to what extent it is used in activities. The general belief is that due to the opportunities provided by artificial intelligence, leaving the processes completely to artificial intelligence can have negative consequences. This suspicion is also related to the use of artificial intelligence in auditing process.

The conclusion reached by the auditor concerns many people. If the audited company is a global company, millions of stakeholders are concerned with this result. Incorrect auditing results can cause major scandals. For this reason, while making use of the opportunities provided by artificial intelligence in auditing activities, possible mistakes due to artificial intelligence should also be prevented.

New algorithms can be developed to obtain evidence during the audit with the artificial intelligence applications used in the audit activities. It can be said that these applications will have a positive effect on the activities, since the opportunity to conduct a more comprehensive examination in a shorter time. On the other hand, it is possible for these applications to include new algorithms in the audit process without auditor intervention. In this case, the auditor may act against the auditing standards or ethical standards by evaluating the evidence and analyses selected without his own will (FRC, 2020). Appelbaum et al (2016), state that artificial intelligence practices should be involved in audit activities with various limitations.

17.8.3 A Sample Application Proposal Of Remote Custom A Software Including Various Audit Matters

The audit batches proposal developed for an applied remote audit software that will cover various audit issues is given below. In addition, it is possible to diversify and develop these audit batches according to the type, purpose and scope of the audits.

1) Duplicate Cash Records
2) End of Day Balance Progress
3) Monthly Balance View
4) Period End Balance Progress
5) Valuation
6) Credit Balance Control
7) Random Document Control

8) End of Day Balances
9) Monthly Balances
10) Periodic Balances
11) Bank Credit Record Control
12) Currency Valuation
13) Term Interest Provision
14) Term Foreign Exchange Deposit Accounts Interest Provision
15) Daily Check and Payment Orders
16) Bank Securities Transaction Distribution
17) Interest Allowance Control
18) Interest Control
19) Total Interest Income
20) Bank Based Interest Rate Comparison
21) Dealer Customer Account Control
22) Sales Maturity Control
23) Open Account Balance Aging
24) Customer Total Risk Guarantee Control
25) Valuation of Foreign Currency Receivables
26) Check Rediscount
27) Bill Rediscount
28) Overdue Check List
29) Overdue Notes List
30) Check Distribution on Customer Basis
31) Distribution of Notes on Customer Basis
32) Check Distribution on Maturity Basis
33) Bond Distribution on Maturity Basis
34) Protest Balance Aging
35) Protest Account Aging
36) Balance Aging
37) Balance Aging for receivables from personnel and other accounts receivable
38) Determination of Periodic Prepaid Expenses
39) Purchase Maturity Control
40) Open Account Balance Aging
41) Reverse Balance Control
42) Debt Balance Aging
43) Debt Valuation in Foreign Currency
44) Duplicate Invoice Amount Control
45) Control of Repetitive Invoice Amount with Same Date
46) Turnover Based on Customers
47) Tracking of Invoices Outside the Sales System
48) Total Invoice Based on Customer
49) Getting an Invoice From Customers
50) Customers Account and Total Invoices Reconciliation
51) Turnover Distribution Based on the Product Purchased from the Sales System

52) Turnover Distribution Based on Products Purchased Outside the Sales System
53) Total Turnover Distribution Based on Products Purchased Inside and Outside the Sales System
54) Waybill Invoice Reconciliation from the Sales System
55) Non-Sales System Waybill Invoice Reconciliation
56) Out of Sales System and Internal Waybill Invoice Reconciliation
57) In-Sales System Waybill Invoice Dates Comparison
58) Non-Sales System Waybill Invoice Dates Comparison
59) Comparison of Out-of-Sales System and Internal Waybill Invoice Dates
60) Gap-Sequence-Duplicate (Gap, Sequence, Duplicate) Control in Invoices and Dispatches within the Sales System
61) Gap-Sequence-Duplicate (Gap, Sequence, Duplicate) Control in Invoices and Dispatches Outside the Sales System
62) Product Based Periodic Price Control
63) Total and Distribution of Expense Accounts
64) Random Expense List
65) Duplicate Amount Control
66) Same Date Repetitive Amount Control
67) Amount Ordered List
68) Civil Servant Monthly Salary Account
69) Workers Monthly Salary Account
70) Paid Severance Pay Account
71) Employees' Severance Pay Burden Account
72) Stratification of vendor balances, check amounts, invoice amounts, purchase order amounts, approval limits, check dates and control in terms of unusual situations
73) Listing of vendors and investigating the possibility of false sellers
74) Comparison and audit of business employees and sellers in terms of possible unauthorized transactions
75) Calculation and control of price changes in goods and services sold by sellers in a certain period
76) Making and controlling the order, deficiencies and double transactions of invoice, purchase order and check numbers
77) Comparison and control of discounts received and not received from the same seller
78) Stratification of payment amounts, hours worked, hour rates, payment dates and control in terms of unusual situations
79) Comparison and control of wage costs between periods
80) Compliance check of fee information by sampling
81) Comparison of information on payrolls and employee databases in terms of unusual situations
82) Sorting and controlling the information in personnel and wage data files in terms of deficiency screening
83) Identification and supervision of employees with the same name, address and telephone number

84) Sorting and checking sales invoices, order forms and loading documents for deficiencies
85) Identification and control of customers with receivable balances
86) Identification and control of stock items with low stock conversion rate
87) Comparison and analysis of unit costs and sales prices from various angles
88) Comparison of standard costs and actual costs and control of deviations
89) Calculation and control of price changes on the same period and the same stock item
90) Calculation of the values of the term receivables on the cut-off date according to the internal rate of return, calculation by two different methods as calculated according to IAS 39 and simply calculated and reporting the difference

As a result, with a total of 90 audit batches prepared and proposed as an example, Company auditors will save a lot of time in many works they do. In addition, a more regular, contemporary and documented working environment can be provided with these batches prepared in the ACL, during the examinations they make on various accounts in audits and control. Thanks to ACL-like audit software and Audit Applications, auditors who get rid of routine work will be able to focus and analyze more on the events they deem important, and identify possible risks, productivity and profitability decreases, performance, operating weaknesses, fraud, corruption and relationships. They will be able to easily perform activity audit as well as compliance audit. First of all, the auditors will now get rid of the sampling method that includes a certain part of the main mass according to certain assumptions, and will have the opportunity to perform inspection by scanning all the data of the audit period. In this way, the disruptions, errors or deficiencies that may arise during the inspections made with the logic of sampling are minimized; A high level of supervision with high efficiency, effectiveness and pleasure will be achieved, in which information technologies and CATTs are used extensively.

17.8.4 Possible Matters Regarding Audit Areas in CAATTs (Example)

Below are sample points that can be tested and determined by CAATTs for different audit areas. However, these items are for guidance purposes and will naturally differ according to "various audit objectives". Sample audit topics are given for a typical business that trades goods. Naturally, different audit purposes and different data query techniques will be used for sectors such as finance, service, and manufacturing.

Examples of Analysis and Inquiries that Can Be Made Regarding Commercial Goods Inventory Records

Some examples prepared&proposed for analysis and inquiries that can be made regarding commercial goods inventory records are given below:

- Record inventory
- The amount of goods giving negative balance
- Abnormally high amount and quantity balance products
- Inventory items with a long waiting period in stock

• Scrap or low value goods
• Remarkable factors such as quantity changes, percentage changes or negative price action
• Goods with a higher cost than the sale price
• Zero or extremely low priced goods
• Comparing inventory with information about physical goods movements such as date, price, quantity
• Comparison of actual inventory count and inventories recorded in inventory
• Stock numbers, product names or definitions listed in duplicate
• Goods that deviate significantly from average prices for certain commodities or groups
• Sorting profitability percentages from large to small with cost-sales price comparisons
• Comparison of inventory outputs with information such as shipping, delivery note, payment
• Divisions of stock movements by months.

17.8.5 Analysis and Inquiry Examples Proposed Related to Purchases, Sales, Receivables and Payables

Analysis and inquiry examples prepared and proposed related to purchases, sales, receivables and payables are given below:

• Average collection-payment periods and significant deviations from the average
• Classification of collection-payment periods based on creditors-debtors
• Purchase-sales invoice numbers that appear in the records repeatedly or bypassing them
• Comparison of delivery and shipping information with invoice information
• Listing of invoice information based on customers and vendors, price comparison within the same name group
• Listing of sales based on sales location, region, seller, product
• Comparing the surnames of customers and vendors with the surnames of partners and employees, and separating purchases and sales by partnerships, kinship, etc.
• Separation of customer and vendor addresses in terms of unusual ones.
• Scanning of customer and seller addresses for affiliates such as partnership, kinship, and similarity
• Listing of customer and seller addresses with missing address and phone information
• VAT accounts renewed and compared
• Placing discount percentages in size order

17.9 Conclusion

Advancements in technologies have led to many changes. Artificial Intelligence, for instance, has changed processes and methods of doing things in many areas. It is possible to reach higher targets in a shorter time with Artificial Intelligence applications. Andrew NG defines artificial intelligence as "new electricity". This statement emphasizes the importance and swiftness of

artificial intelligence in delivering results. That's why businesses are increasingly using Artificial Intelligence.

The inclusion of artificial intelligence in accounting activities of businesses made it compulsory for artificial intelligence applications to be incorporated in CAATTs applications used in audit activities.

With these applications, auditors can analyze complex data more comprehensively and reach more reliable results. Artificial intelligence also provides an opportunity to reach meaningful results among variables that have not been previously analyzed from a broader perspective.

Errors that may occur in the audit could lead to critical consequences. Additionally, artificial intelligence can be used for cheating purposes and can be directed unethically. Various authorities and institutions emphasize that artificial intelligence should be used with the auditor and with certain limitations to prevent possible errors.

All these developments emphasize that the auditor's technical competence should be increased in order to understand the software used by the companies they audit and easily adapt to new audit practices. Although the new implementations are prepared in such a way that those who do not have technical skills can easily use, the auditor should have the ability to understand the processes. Furthermore, the use of artificial intelligence and computer-assisted audit techniques and tools in the audit process is increasing intensively. The use of these techniques and tools has now been moving to a more advanced stage. As suggested in the text, comprehensive audit software and detailed specific audit batches for different audit areas and audit applications developed have been increasingly used by auditors. This has resulted in positive effects such as decrease in audit and fraud risk, low audit cost, shorter audit time and increase in audit efficiency and added value.

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