APPLICATION OF ARTIFICIAL INTELLIGENCE IN CONTROL SYSTEMS OF ECONOMIC ACTIVITY

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Abstract. The implementation of the tasks of evaluating historical financial information, the control or audit of business activities are based primarily on professional judgments about the object of study of a professional accountant or auditor. Their findings are drawn on the review of documents, the use of audit evidence, risk assessment, etc. There is always a probability (and rather high) that professional judgment will be based on incomplete information (since the dynamics of information changes is extremely high today), on the misstatements (since it is impossible to trace all the changes in knowledge related to the object of study), regardless of the quality of the performance of these individuals. In addition, the auditor often takes subjective decisions (for example, when choosing individual elements for the assessment from the general population), which also affects the degree of objectivity of his assessments. Artificial intelligence is the tool that could handle the entire set of knowledge, track all changes in the significant and important information, as well as in the insignificant and unimportant (which, however, also has an effect on the object of analysis). It does not have a work schedule or other restrictions on the time of work, so the comparison and analysis of information can be carried out around the clock, and the speed of data processing is determined by the processing power of the information systems, on which it operates, and is stably high. In this case, the artificial intelligence is ready to perform the tasks non-stop in real time till receiving the command of the termination of the process. This article proposes a methodology for the artificial intelligence use in the control systems of economic activity, reflects the artificial intelligence concept in the control systems of economic activity, indicates the goals, principles, tasks and its functions when checking an object.

Keywords: artificial intelligence, audit, control, economic activity, methodology, concept

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1. Introduction

As a rule, science moves forward in proportion to the array of knowledge acquired earlier. At the same time, the current speed of transferring information and replacing data sometimes leads to the opposite effect, when the body of knowledge does not contribute to the growth of science, but prevents it. So, today, the body of information received by a person per day can be compared with a Big Data array, to which the information comes from everywhere, structured and unstructured, necessary, secondary and really useless knowledge. To concentrate on the necessary data or unambiguously and objectively classify information, when its sources are so numerous, and the speed of its updating is so high, is very difficult and requires considerable efforts from everyone, especially from the decision maker.

For example, the implementation of the tasks of evaluating historical financial information, the control or audit of business activities are based primarily on professional judgments about the object of study of a professional accountant or auditor. Their findings are drawn on the basis of the study of documents, the use of audit evidence, risk assessment, etc.

There is always a probability (and rather high) that professional judgment will be based on incomplete information (since the dynamics of information changes is extremely high today), on the misstatements (since it is impossible to trace all the changes in knowledge related to the object of study), regardless of the quality of the performance of these individuals. In addition, the auditor often takes subjective decisions (for example, when choosing individual elements for the assessment from the general population), which also affects the degree of objectivity of his assessments.

Artificial intelligence is the tool that could handle the entire set of knowledge, track all the changes in the significant and important information, as well as in the insignificant and unimportant (which, however, also has an effect on the object of analysis). It does not have a work schedule or other restrictions on the time of work, so the comparison and analysis of information can be carried out around the clock, and the speed of data processing is determined by the processing power of the information systems, on which it operates, and is stably high. In this case, artificial intelligence is ready to perform the tasks non-stop in real time till receiving the command of the termination of the process.

According to some forecasts, personal computers will achieve the processing power of the human brain in 2020; laws that regulate the relations between people and robots will be enacted in 2022; it will be possible to extend the life of a person by more than what has passed per unit of time in 2026; in 2040, search engines will work not only based on queries from the voice of a person, but also from thoughts; in 2043, the human body will be able to take any form thanks to nanorobots and cybernetic devices, which will replace human organs with significantly higher quality; in 2045, a technological singularity – the transformation of the planet into a solid computer, when technological progress is beyond its understanding – will come (SPACE, 2016).

Such transformations are also linked to the development of artificial intelligence (AI), which is currently not a concern, but the pace of its refinement leads to the reflection and consideration of trends for the development of all branches of science, including economics. Therefore, the question of the use of artificial intelligence in the control systems of economic activity is becoming increasingly relevant, which has led to the choice of the topic for the research.

In this work, the concept of "auditor" is used in the narrow sense in accordance with the International Standards on Quality Control, Auditing, Review, Other Assurance and Related Services Pronouncements and, in a broad sense – the person, who verifies, controls financial and other statements, gives confidence that the information is correct and is the subject of the control. In any case, now by "auditor" we mean the person, who is responsible for making final decisions about the misstatements in the information on the economic activity of the control object.

2. Literature review

The issue of the application of artificial intelligence in the daily life of every person, as well as enterprises and states, is receiving attention today at different levels. Such reports are prepared at the state and international levels by the leading organizations in the field of business consulting and information technology.

An analytical document prepared by the House of Lords of the United Kingdom talks about the positive opportunities that artificial intelligence can provide to the British economy, in particular, by optimizing business processes and the associated risks (Select Committee on Artificial Intelligence (House of Lords), 2018). The authors of the report support the AI and offer to inform the public, when AI is used, to make important or sensitive decisions. The introduction of such a rule, perhaps, would be the first regulatory measure to streamline the relationship between humans and artificial intelligence since 1955, when it was first discussed in the world. At the same time, researchers note (Select Committee on Artificial Intelligence (House of Lords), 2018), that it is necessary to constantly pay attention to the raising of public awareness of the digital environment, information technology and, in fact, artificial intelligence. This is what the development and the positive trends in the implementation of AI will be based on. However, it was rightly noted that, for example, in school curricula it is advisable to increase attention on computer science at the expense of objects of art or the humanities that form creative, contextual and analytical skills.

In science fiction films, there are often like-minded anti-globalists with the slogan "Robots take jobs", which is not meaningless in the development of our topic and questions about the future of AI. The issue of the impact of AI on employers and workers was assessed by specialists of PricewaterhouseCoopers (PricewaterhouseCoopers, 2018). They rightly point out that changes in employment will be more likely to concern retraining of workers: indeed, some professions will disappear, but new and more highly qualified ones will replace them. In addition, such changes are actually a constant companion of technical evolution and these

changes are noticeable at every stage of the society development. The same as ever, these changes will be evolutionary, rather than simultaneous. So, the profession of chimney sweeps before the invention of steam heating (especially based on natural gas) was also popular and also did not disappear immediately, since only gradually the steam heating came to most houses. And today, workers, who install gas boilers, are popular and uniquely more skilled than the chimney sweeps.

Today, perhaps, the most successful and illustrative example of the application of artificial intelligence is targeted sales and advertising. An analytical report by experts on Deloitte (Deloitte, 2018) is dedicated to these issues. Processing a significant amount of data and the decision to offer a particular product to a specific buyer at the right time - AI systems are coping with this task today. Researchers note an interesting solution that uses Rapidmathematix in the pricing system: prices in the online store are updated almost every second depending on the time of day, market, shelf life of the product, season, customer sentiment, etc. Indeed, the product value for each of us depends on many factors and can change at any time. Why not change its value to buyers to maximize turnover and profits?

Insurance companies that calculate their risks based on global and individual conditions of the surrounding world should always be aware of the latest developments. So, one of the largest insurance companies in the world, Allianz points to seventh in the ranking of the main risks to business, the impact of artificial intelligence and other forms of the latest technology. This type of risk, according to insurance company specialists, is more significant than, for example, political risk and climate change risk (Allianz Global Corporate & Specialty, 2018). In particular, we are talking about improving road safety thanks to the AI. And the number of traffic accidents will decrease by 90%. Indeed, using 5G data transfer technology, it is possible to integrate car systems with road traffic control systems, and AI will help to determine the probability of an accident depending on the speed and trajectory of each car in the stream and, for example, suggest the driver to change the movement parameters to avoid an accident.

The main fears associated with the implementation of AI are usually rooted in ethical aspects. The UNESCO publication refers to three categories of such risks (UNESCO, 2018):
    - labour shortage – machines, not people can do the job;
    - consequences for the autonomy of the individual: on freedom and human security;
    - advancement in the development of mankind by more "intelligent" machines that are able to process significant amount of information faster, make decisions, and have access to a significant number of information sources.

P.H. Winston (1992) identifies two components of the goal of introducing artificial intelligence: engineering, which consists in solving real problems using AI as a tool of ideas that would represent and use knowledge, build systems; and scientific, which is based on the fact that AI should determine what ideas will represent knowledge, use them and build systems, taking into account various types of intelligence.

At the same time, the author identifies some areas of AI application and explains their capabilities, in particular: on farms – to control the number of pests in the fields, pruning trees, sorting crops using computers; at home – to provide advice on purchases and ration, home cleaning; in schools – to identify the reasons why pupils or students make mistakes, and not just respond to them, etc. (Winston, 1992).

Indeed, each person, buying food at the supermarket, stops in front of a shelf with a significant assortment of similar goods from time to time to look through the components of the product, date of manufacture and expiration date. It is especially difficult to decide, when there are more than 20 components of the product, 5 or more analogues, and a number of unknown factors that should influence the decision, and lack of information to make it at the optimal level.

So, for example, baby food has 26 components, the choice in the supermarket is represented by 5 or more brands. Comparison of the tables with the elements on each package and understanding that, for instance, Hipp milk has 51 kilocalories of energy value per 100 grams of product, and Nestle 67 does not guarantee that Nestle will be more beneficial for the child, since Hipp has more vitamin D and potassium in its list of components. At the same time, the buyer does not know the latest research on how many such elements a child needs at each stage of his/her development, and whether such an amount is suitable for the child of this particular buyer.

Products or services also vary in price. So, it is possible to choose products that are absolutely identical in terms of quantity and make a decision based on price (according to the preferences), and ultimately not take into account qualitative factors, for example, on the practical use of the product, which cannot be taken into account without analysing the opinion of customers who have already bought it or not having completed the research itself, again spending their time and money on it.

Almost every person makes a lot of such decisions throughout life. Evaluation of the time taken to analyse factors for making the optimal decision is not the subject of our study, nevertheless, it is obvious that this process takes a lot of time. In addition, the decision after analysis of the factors is rarely quite far from ideal or optimal – rather, it is random.

Artificial intelligence is intended to meet such or similar challenges, when there are many factors, and sometimes the price of a mistake is health or life, when it concerns, for example, medicine, diet, etc. It is able to help in the analysis of the necessary information with higher efficiency. It saves time a person can spend on other areas, where it is more needed.

P.H. Winston suggests answering the following questions in order to determine, whether artificial intelligence can successfully solve the problem (Winston, 1992):
    - Are the tasks formulated clearly?
    - Is the procedure that performs a specific task implemented?

- Is there a set of identified patterns or limitations, from which the implemented procedure gains its strength?
    - Does the program solve a real problem?
    - Does the program open up new possibilities?
After the positive answers to these questions, it is possible to build a control system of economic activity.

International Standards on Quality Control, Auditing, Review, Other Assurance and Related Services Pronouncements (International Auditing and Assurance Standards Board, 2018a; 2018b) are recognized in the world and are used to build a control system of economic activity.

In particular, it was determined that the purpose of the audit is to increase the degree of confidence of certain users in the financial statements. This is achieved by the auditor's opinion on whether the financial statements are prepared in all aspects in accordance with the applicable financial reporting framework or not (International Auditing and Assurance Standards Board, 2018a; 2018b). The auditor should receive reasonable assurance that the financial statements as a whole do not contain misstatements because of fraud or error. At the same time, reasonable confidence means a high level of confidence. It is achieved, if the auditor has received sufficient audit evidence required to reduce the audit risk (the risk that the auditor will express an inappropriate opinion if the financial information contains misstatements) to an acceptably low level. However, reasonable assurance is not an absolute level of assurance, since there are inherent audit restrictions that make the majority of the audit evidence, on which the auditor draws conclusions and bases his/her opinion, more convincing than final (ISA 200, §3). Hence, there is no absolute confidence either in the objectivity of the data presented in the financial statements, or in accuracy of the auditor's conclusions. Such a risk of "convincing" conclusions would be acceptable if decisions based on the results of the audit were made conditionally. However, specific figures depend on the reports on the results of inspections, for example, tax deductions, penalties, people's fates, business reputation, etc.

A study of these and other sources revealed that research on the use of artificial intelligence does not pay enough attention to the possibilities of its use in control systems and audit of economic activity.

Modern findings in the field of artificial intelligence research are definitely significant and valuable (Bochulia & Melnychenko, 2019; Bochulia & Yancheva, 2017; Dalevska et al., 2019; European Political Strategy Centre (European Commission), 2018; Girchenko & Kossmann, 2016; Kwilinski et al., 2019a; 2019b; Lakhno et al. 2018; Omoteso 2012; Russell & Norvig, 2016). However, real results are not used in practice due to the lack of methodological support for the regulation of the work of artificial intelligence in this area. The actual development of a separate unit, for example, responsible for working with documents and information in the framework of the audit, requires significant investments that can bring tangible results, or may not work at all. For example, it is not known whether the entrepreneurs will be interested in an absolutely objective, unbiased audit with zero probability of not detecting violations. Is a

global, interstate, large national or small business ready to conduct a completely transparent activity, based on blockchain technology, which implies, in fact, an objective and impartial audit (Kwilinski, 2019; Melnychenko & Hartinger, 2017)?

3.   Methodology

The role of artificial intelligence in the realization of assurance tasks lies in increasing the effectiveness of the control system.

This goal is achieved through the implementation by artificial intelligence in the process of auditing the following functions:
- improving the quality of data processing: considering, apart from important noticeable and significant data, also important imperceptible, secondary noticeable and imperceptible, as well as even insignificant, omissible and imperceptible data for analysing information and identifying the truth;
- increasing the productivity of the audit system by the analysis of the information, associated with the object of audit, round-the-clock, without fatigue, distraction, with a stable high speed of data processing;
- acceleration of reaction to changes in the information space and considering all possible factors that influence or have influenced the decision-making associated with the object of audit, reduce the risk of errors caused by obsolete knowledge.

Performing these functions depends on specific tasks according to the type of control object. Thus, before setting the task to artificial intelligence, it is necessary to classify the object according to different features: volume, size, scale, level, etc.

For example, the control over the correctness of the calculation and payment of value added tax is appropriate to assign to artificial intelligence, in particular, in part of the comparison of information in the regulations, primary documents, agreements with counterparties, budget movement report for funds in bank accounts, tax returns, etc., when it comes to a separate enterprise. Otherwise, it is advisable to describe the level of information support when it comes to state-level control. In addition, the information from the tax authorities, data from registers of different levels, etc. should be used as well.

Therefore, the tasks of artificial intelligence in cooperation with the auditor in the control systems of economic activity are:
- analysis of complete information about the object of control and its individual elements, including indirect, in particular, Big Data research;
- comparison of the information about the object of control with the analysed information;
- identify inconsistencies that lead to misstatements in the financial or other business reporting of the entity.

As a result, the risk of the auditor's failure to detect serious or minor misstatements because of fraud or error will tend to zero.

4. Results

Artificial intelligence in business control systems refers to the modelling of human intelligence in machines that are programmed to think like humans and that mimic their actions to detect irregularities and distortions in the accounting system caused by fraud or human error. Its characteristic features are training and solving problems in identifying anomalies in primary documents, reporting registers, etc.

The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal, which is to analyse all the information and prove existing inaccuracies.

Artificial intelligence is based on the principle that human intelligence can be defined in such a way that the machine can easily simulate it and perform tasks.

The objective of artificial intelligence in business control systems is to find out how the patterns established in the set of information can be understood as individual cases of more general patterns.

Artificial intelligence goals include learning, reasoning, and perception.

In the process of learning, the system must, first of all, find out the basic principles (full coverage, autonomy, consistency, continuity, accrual, entity over form, etc.), elements (documentation, inventory, estimation, calculation, billing, double entry, balance sheet, reporting) and methods (primary observation, cost measurement, grouping and systematization, summary generalization) of accounting.

Therefore, when comparing information and data from the accounting system of the studied object with those from other, external sources of information, artificial intelligence should reveal those inconsistencies that violate one or more principles. Such detection should also be based on the appropriate application of all elements and methods in the accounting system.

Reasoning is based on causation, which will allow the information in the financial statements to be objective or vice versa to detect distortions or anomalies. For example, by evaluating the costs recorded in the accounts, the system will compare them with counterparty bills, contracts, as well as data from the registers on the activities of such counterparties, on displaying in their data the information on the corresponding revenues, will check the types of activity of such company for the possibility of the provision of relevant services or sales of goods, and will control the possibility of attributing such costs to the costs of the audited entity, etc. After such a thorough verification, artificial intelligence will "express" the assumption of the accuracy of the displayed data and the compliance of the operations with the current legislation.

Perception of artificial intelligence is the process of forming images on the basis of information received in different forms and in different ways. It is based on the experience and knowledge gained during the training and on the conclusions drawn from the reasoning. Perception is already the highest manifestation of the psychological activity of artificial intelligence, when reality is perceived as a whole or in individual elements. For example, the balance sheet as a form of financial reporting is perceived by artificial intelligence (as by an experienced enterprise accountant) not as, for example, a table with a set of assets and liabilities or as a set of indicators with a corresponding taxonomy, but as a complex category, which reflects the essence of the business activity as a complex system with a certain set of personnel, tangible and intangible assets, sources of their formation, each of which has its own history, origin, processes, etc.

A modern example of the effective work of artificial intelligence, elements of which can be used in business control systems, is its work in Google Maps application for smartphones when used as a navigator. Thus, when traveling along a route, for example, by car, the user firstly receives recommendations from the system regarding directions, turns, etc., secondly, analyses the current road situation and determines the time of getting to the necessary destination point, considering traffic light congestion, road traffic. Thirdly, it identifies and evaluates, in real time, alternate routes and offers the user another, more optimal or faster route, if there is any during the journey, etc. In this way artificial intelligence constantly analyses the extraordinary number of factors coming from a large number of sources of information: from the same users, who also have the Google Maps app activated, from road services, from its own technical tools that monitor the situation on the roads, and at the same time, from the numerous analysed roads in all the continents, in all the countries, cities, villages and between them.

In general, if do not fall into the theory of global conspiracy, Google's system has a number of tools and, most importantly, information on society that can control different areas of human life or the activities of different businesses and institutions. This is true for every person and every entrepreneur, from the health by the search queries and taste preferences, to competitive intelligence and plans to bring new products to the market.

5. Conclusions

Therefore, unlike most other information systems, artificial intelligence uses probabilistic processes, rather than clear rules and algorithms to obtain results. Unlike auditors, which verify information depending on the expected result, artificial intelligence "does not expect" any result, but only the probabilities of each of the results. Actually, unpredictability of the results creates a risk, creating potential problems for auditors, who use traditional methods.

In addition, the algorithms of artificial intelligence systems in the control systems of economic activity may change with changes in the processed data. In contrast to the approaches of the work of auditors, who act in accordance with the compiled program. At the same time, the results of the automated audit support systems are determined by the programmed algorithm,

and not by the data that does not change the algorithm. In control systems, based on the use of artificial intelligence, data is an integral part of the algorithm.

This article describes the concept of the application of artificial intelligence in business control systems, and shows the goals, principles, objectives and functions of the object.

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