ARTIFICIAL INTELLIGENCE AS A METHOD OF OPTIMIZING RISKS AND COSTS IN THE PROCUREMENT OF HIGH-TECH METALLURGICAL PRODUCTS

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Abstract

Artificial intelligence today has become a tool suitable not only for solving household and industrial problems, but also for optimizing and improving the efficiency of business processes. Using the example of the procurement of high-tech metallurgical products, the article demonstrates the areas of effective application of artificial intelligence in a multi-stage international project. The analysis of this procurement as an experiment is combined in the article with inductive generalizations of a practical order and systematization of expert opinions on the role and legal status of artificial intelligence. Rational use of IT does not eliminate a person from the project but allows you to focus the specialist's attention on expert issues. Big data processing and forecasting possible risks are the areas in which artificial intelligence is able to qualitatively reduce costs and serve to obtain a better result. And modern metallurgy today is one of the most promising industries for the application of this approach.

Keywords: Artificial intelligence, procurement, metallurgy production, logistics, high technologies

1. INTRODUCTION

For a person not involved with the industry, metallurgical products are associated primarily with rolled steel and similar resources. However, in the twenty-first century, a huge and costly layer of metallurgical procurement involves the purchase of complex, high-tech equipment. Such purchases take place in several stages and require not only in-depth expertise, but also the processing of a large amount of information and documents. The synergy of several industries and well-developed logistics are prerequisites for successful implementation of such procurement.

When purchasing complex equipment, the number of factors and their interrelationships is so great that machine processing of information is required to successfully select a winner. And sometimes not only the automated calculations following a human-defined matrix are needed, but also the introduction of artificial intelligence.

The problem is that decision-making by artificial intelligence within the framework of business processes cannot be fully transparent. The process of big data processing remains to some extent a "black box" for an outside observer: the input parameters and the result obtained are clear, but the process of transforming one into the other cannot be fully controlled by a human.

This raises several questions. Is it appropriate to use artificial intelligence in technological and business processes? Who is responsible for the decisions made by artificial intelligence? And what is the role of humans in such a relationship?

Using inductive reasoning, as well as relying on methods of synthesis, analogy, generalization and using a practical situation as an experimental model, we will try to answer these questions using the example of purchasing complex metallurgical products for the purpose of knowledge-intensive research.

Below, after a brief literature review, the parameters of this procurement will be revealed in the description of the case study, after which the key theses will be proposed in the discussion section and summarized in the conclusion.

2. LITERATURE REVIEW

Within the scope of one article, it is impossible to give a brief review of the whole variety of studies devoted to the problem of using artificial intelligence in economic and legal relations. Therefore, we will cite only the key theses that are important for this study.

We should start with the fact that today in science there is no consensus on the essence of robot or artificial intelligence. For example, it is proposed to understand a robot as a bodily artificial object or system that has the ability to physically manifest itself, to perceive, process and to some extent influence the surrounding world [1]. While agreeing to some extent with this definition, it is still necessary to emphasize that today corporeality is a purely optional characteristic. Simply put, a robot can evaluate a supplier, calculate logistics and make purchases while remaining completely in a virtual environment.

Some researchers understand AI as a piece of technology that would be identical to human consciousness [2] in its mental properties and nature of functioning. Others define artificial intelligence as something that has nothing in common with humans, but is capable of solving tasks of similar or higher complexity - the term "thinking" and "consciousness" in this case is applied to AI only with a high degree of conventionality[3]. Some people are ready to call artificial intelligence any intelligence that realizes itself as an independent person, regardless of whether it is comparable to human intelligence or even inferior to it in terms of intellectual activity [4].

In practice, the use of AI in economic activity is associated with the risk of causing harm, which is also the subject of special research [5]. At the same time, American experts are already discussing the need to implement the concept of criminal liability for actions of AI, taking into account the guilt of the creator, programmer, user and other persons involved in the work of AI [6] . An alternative solution is to grant artificial intelligence the legal subjectivity of the entities, for example, corporations: this approach allows to apply liability to AI with the help of legal fiction and at the same time provide real compensation for the damages caused [7].

Such issues related to the legal subjectivity of artificial intelligence as the status of a robot-driver and the order of distribution and realization of legal liability for the harm caused by it remain outside the scope of this article. Special studies have been devoted to these issues, which mainly tend to the conclusion of subsidiary liability [8] - or, more precisely, the matrix of liability, on the basis of which the question of imposing adverse legal consequences is decided individually in each specific case, taking into account a set of facts [9].

At the same time, we should not leave aside the very issue of legal subjectivity of AI, which is the key issue for this study. To simplify, in the international discussion we can distinguish several key approaches to solving this issue: stating that there is no possibility of recognizing the legal subjectivity of artificial intelligence [10], applying legal fiction by establishing legal subjectivity of AI similar to that of legal persons [11], or even forming a new branch of legislation dedicated to the specific regulation of the status of artificial intelligence and the specificity relevant to this matter [12].

It is necessary to stipulate that the question of the legal subjectivity of artificial intelligence cannot be solved once and for all. "What constitutes AI is subjective and best described as a moving target. What AI is for one person may not necessarily be AI for another, what was considered AI say fifteen years ago is nowadays considered commonplace and even the question of 'what is intelligence?" is contested and debated [13].

Below we will propose a solution to the question of the legal subjectivity of AI and responsibility for its decisions that, in our opinion, is relevant to the current level of technology development.

3. EXPERIMENTAL PART

Is the question of the use of AI in economic relations relevant? As a case study of a practical example, the procurement for the construction of the (МУР3) magnetic circuit for the Joint Institute for Nuclear Research (JINR) NICA project can be considered. This project required a new particle accelerator facility to study the properties of dense baryonic matter.

A magnetic core is a prefabricated structure weighing more than 700 tons, which has specific material and magnetic properties. The body of the magnetic circuit is a key part of the MPD detector operating within the framework of the NICA accelerator complex. Both the purpose of this complex and its technical characteristics of the magnetic circuit are highly scientifically intensive. At the same time, it is an example of a metallurgical product of deep processing.

JINR, as the leading organization of the NICA project, has developed the design documentation for the future magnetic circuit. According to the design documentation, the manufacturing of the main parts of the magnetic circuit was distributed between two manufacturers, which should manufacture in parallel. This was necessary to meet the deadlines of the project. Plants in Kramatorsk (Ukraine) and Genoa (Italy) were selected as manufacturers.

For the processing of workpieces, the production of the necessary parts and technological equipment, the Vitkovice Heavy Machinery (VHM) plant (Czech Republic) was chosen. At this plant, the structures ensuring the transportation of individual parts of the product to the place of their final installation were produced.

After manufacturing, the workpieces underwent a complex acceptance testing process. As part of the acceptance, the following parameters were strictly checked for each workpiece:

- Dimensions.
- Chemical composition.
- Mechanical properties.
- Magnetic properties.

If at least one parameter is rejected, there could be a threat to the implementation of the entire project. After successful handover at the manufacturing plants, the workpieces were transported to the Czech Republic to the VHM plant. At the same time, taking into account the fact that the workpieces were produced in different countries, it was important to ensure the correct choice of the customs regime for the import of workpieces into the Czech Republic for their subsequent simultaneous processing.

In order to start processing the delivered workpieces, VHM, on the basis of the JINR design documentation, developed its own factory design documentation, which included the following sections:

- Incoming inspection of workpieces: dimensions measurement, measurement of the geometry of parts, preparation of technical passports.
- The procedure for processing workpieces.
- Requirements for the manufacture of parts necessary for the assembly of the magnetic circuit.
- Requirements for the manufacture of tooling for the assembly and disassembly of the magnetic circuit.
- Technological map of the control assembly of the magnetic circuit at the VHM plant with the participation of JINR representatives, that included the installation and adjustment of the relative position of the parts of the cradle.
- Methodology for measuring the horizontality of the base plates and control measurements of plate geometry at various stages of assembly.
- The order of preparation for shipment: drilling holes and the location of fixing pins after control assembly, marking pins, creating a map of the location of pins, disassembly, packaging, loading, transportation.

On the part of JINR, a temporary customs zone was organized in the area of the Institute for customs clearance of the components imported from the Czech Republic to the territory of the Russian Federation. This step was due to the size and weight of individual parts, which did not allow the specified products to be brought to standard customs terminals.

Finally, after the transfer, trial assembly of the supplied equipment by the Institute's staff began at the JINR.

The example briefly described above shows that the complex purchase of high-tech products of the metallurgical industry is a full-fledged multi-stage project in which enterprises from different countries can be involved. This purchase is not limited to a tender but includes tasks in a variety of areas. For the successful implementation of such a purchase, the following paths must be taken into account:

- Technological path.
- Engineering path.
- Logistics path.
- Customs path.
- Financial and accounting path.
- Contractual path.

The complexity of the procurement is enhanced by the fact that failure in at least one of these areas makes it impossible for the end user to use high-tech metallurgical products. What costs and risks associated with the purchase of high-tech products do we see in this example?

First of all, it is the risk of choosing a supplier. An inexperienced, unqualified manufacturer - or simply a factory that does not have the necessary equipment - will not be able to produce the necessary high-tech products.

The second risk is the risk of errors in the technical documentation. Incorrect calculation or even just an incorrect description of the data at one of the stages of manufacturing or assembly can jeopardize the result the entire delivery.

The third risk is the risk of the transportation. It is important to take into account that the dimensions and weight of even individual elements of the described equipment required the involvement of a dozen trucks in the transportation. At the same time, the cost of high-tech products dictated increased requirements for safety during transportation.

Since the purchase of high-tech products is often associated with international cooperation, the risk of customs clearance is adjacent to the logistical risk. And the fact that the end user was a scientific organization located outside the EU only increased the significance of this risk.

Finally, the risk that should not be disregarded is the risk of error in the execution of contractual relations and payments for manufacturing, debugging and transportation. Correct, timely and properly executed calculations in such a purchase are a task that is difficult in itself. Unforeseen offsets and the need, for example, to purchase an additional tool for the contractor from the customer's funds, only increase the difficulties and increase the risk of unintentional error.

Traditionally, such risks were entirely assigned to the employees of the customer and supplier. In this situation, the possibility of minimizing each risk depends entirely on the qualifications of the employee, the level of his expertise, the amount of information available to him and the availability of time for its processing.

However, the current level of information and management technologies makes it possible to separate the professional expertise and competence of a person from the tasks of collecting and processing information. After all, a robot is able to process incomparably large amounts of information in significantly lower amounts of time.

It seems that for solving problems in the field of business management, the key is not the question of the essence of cognitive processes or self-identification, but the ability to process large amounts of information in less time and at a lower cost compared to a person or a group of people.

In reality, it is the processing of big data that logically represents the scope of effective application of artificial intelligence. In the above example, this can be, firstly, data on the qualifications of potential manufacturers, including information about their experience, the qualifications of the employees, the culture of production, the availability of the necessary equipment, compliance with social and environmental responsibility, financial sustainability, etc. Secondly, these are data on possible logistical combinations and the associated transport, administrative, weather and other risks. Thirdly, it is the processing of an array of engineering and technical information with the formation of proposals for optimal parameters.

However, it is important not to forget that the results of big data processing usually serve only as recommendations for the decision-maker, and not the decision itself. A robot does not have to replace a person.

4. DISCUSSION

In our opinion, a balance should underlie the introduction of artificial intelligence capabilities to business processes: big data processing is carried out according to a given algorithm by a robot - but both the formation of this algorithm and the interpretation of the results of big data processing are carried out by a person. And this ratio is all the more important, the higher the cost of a mistake. If this price is high, then at the current level of technology development, we, as a rule, cannot entrust the solving to artificial intelligence.

Both from the point of view of the proposed balance and from the point of view of the current level of technology development, AI cannot be considered as a full-fledged subject of economic relations: no matter how great the role of a robot is, today it is not a subject, but a tool. However, the situation may change in the future.

At the same time, the lack of subjectivity does not reduce the practical significance of AI in making multifactor decisions. The case study outlined above provides an example that at the stage of assessing already identified risks, artificial intelligence can play an important role in automating risk assessment using the following technologies:

- Predictive modeling: Predictive modeling algorithms can be used to predict the likelihood of certain risks occurring in the future and their potential impact.
- Risk assessment. Risk assessment algorithms can be used to assess the potential impact of a risk and determine an appropriate action plan. An algorithm can be trained on historical data to estimate the impact of a particular risk based on past incidents.
- Decision making: AI-based decision-making systems can be used to determine an appropriate course of action based on the potential impact of a risk. For example, a decision-making system can be used to automatically activate emergency protocols in the event of a natural disaster.
- Risk modeling: AI can be used to model various scenarios and assess the potential impact of risk. For example, modeling can be used to assess the impact of a cyberattack on a company's operations.
- Optimization: AI can be used to optimize resource allocation and determine the best course of action to minimize the impact of risk.

But if we trust AI not only to collect and analyze information but also to influence decision-making, then for all the perceived benefits - speed, impartiality, accuracy, etc. - we face the question of responsibility for the consequences of such a decision. Including the question of AI responsibility.

From the point of view of legal theory, the very concept of AI liability is more than controversial today. Firstly, it is an open question whether AI is capable of realizing its actions as illegal and whether the concepts of intent

or negligence are applicable to it. Secondly, in practice, adverse consequences applied to AI will inevitably become a cost for a particular person or organization: for example, a hypothetical fine for a robot will in any case have to be paid by its owner, a hypothetical disqualification of a robot will mean downtime for a company, etc.

In this situation, a person or organization would be responsible for the robot's actions in any case. But by whom, exactly? The simplest answer to this question seems to be presuming the responsibility of the owner of the artificial intelligence by analogy with the responsibility for causing harm by a source of increased danger. The norms of the European Union law now seem to be developing along this very path - this is evidenced, for example, by the drafts associated with the EU's Approach to Artificial Intelligence [14].

However, experts rightly note that full identification of AI with a source of increased danger is inappropriate, and the responsibility for potential harm should be borne by the person who programmed it or the person responsible for its operation [15]. In our view, these two approaches are not mutually exclusive: the presumption of the owner's liability should not deprive the latter of the right to prove the occurrence of harm due to faulty programming or faulty operation - with a corresponding redistribution of liability.

5. CONCLUSION

The problems of AI legal subjectivity do not mean that artificial intelligence has no place in business processes. There is space for its application, but its scope of application should be rationally defined and strictly specified at the level of union or national legislation, and before such legislation appears - at the level of corporate regulation.

At the same time, both from the point of view of jurisprudence and from the point of view of business, the decision-maker must remain a human being. AI is not a subject, but a tool for increasing the efficiency of economic relations and a tool for reducing risks in their realization. Here we can draw an analogy with the creation of works of art using AI: the creator of such works remains a person, and the fact of using a software algorithm as a tool only suggests that these works should be classified as the so-called "generative art" - i.e. art created with the involvement of IT [16].

"The software and hardware package does not "purloin" the authorities beyond the algorithm set to it. Its role of a deal subject follows exactly from the algorithm execution - because it is convenient for both the client and the supplier to use the robot to determine the terms, volume and object of delivery. This allows both the client and the supplier to release resources for the main production activity. But from the civil-legal viewpoint it is the results of the artificial intelligence functioning that generate mutual rights and obligations of the client and the supplier" [17].

The example of cooperation in procurement is particularly illustrative of the principles of the definition of this area. Technical implementation, on the contrary, requires a formalized part of procurement interaction in a specialized digital environment providing legally significant document flow and exchange of electronic messages.

However, for the procurement of high-tech metallurgy products, it is also important for this environment to have successful samples of technical documentation in machine-readable form. After all, it is the processing of such samples that should serve as base data for AI, which will allow it to form a relevant output.

Thus, today we can talk about AI as an applied tool for cost optimization and risk minimization in the procurement of high-tech metallurgy products. With its help it is possible to really save time and money. However, in order to achieve such results, it is extremely important to make a well-considered investment in the creation of such a tool and in the formation of an environment for its subsequent repeated use.

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