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The Usage of Artificial Intelligence in Strategic Decision Making in Terms of Fourth Industrial Revolution

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***Abstract*—The total digitalization of the economy and society will inevitably lead to significant changes in the system of management of the organization, including strategy management. The use of artificial intelligence systems and robotics carries with it both tremendous opportunities and threats of the disappearance of certain jobs. There is no doubt that artificial intelligence will be able to take on the routine administrative functions of management - coordination and control and also will be indispensable in the strategic analysis of different factors of the macro- and microenvironment of the organization, the analysis of its strengths and weaknesses, opportunities and threats, analysis of the corporate portfolio. The article is dedicated to the usage of artificial intelligence in the process of taking strategic decisions.**

Keywords: digital economy, strategy management, artificial intelligence, fourth industrial revolution

I. INTRODUCTION

Today the world is on the verge of a new technological structure - age of nano- and biotechnologies, mass digitalization and robotization of all sectors of the economy and artificial intelligence systems. Even today deep machine learning technologies are capable of taking artificial intelligence to a whole new level, surpassing the level of human intelligence in solving a number of problems [2].

The many uses of artificial intelligence are changing our lives today, influencing the way we work, make decisions, communicate and make purchases [5]. At the current stage of its development, many questions arise to the systems of Artificial Intelligence: how to determine what is Artificial Intelligence? Which applications of the AI will bring more profit, and which will only contribute to increased costs? What are the risks of its development for the business environment and society? Is it necessary to regulate the scope of AI and, if necessary, how?

Since today the use of deep machine learning allows artificial intelligence systems to solve a fairly wide range of problems, there are reasonably well-founded fears regarding the fulfillment of part of the management functions of intelligent machines [2].

Today AI creates added business value to the market leaders in various industry verticals who are increasing their investment in digital technologies and developing large-scale strategies based on Artificial Intelligence usage.

Business community and government representatives around the world today have come to understand the benefits that the implementation of artificial intelligence technology brings, but most business representatives do not yet fully understand how technology must be applied to achieve the results they need.

Among the benefits from the introduction of Artificial Intelligence systems, we can highlight the following:

- improvement of customer service due to an increase in the level of customization, the ability to respond more quickly to customer requests, increase their satisfaction;

- increase business efficiency due to increased productivity by means of the innovative technologies and lower transaction costs;

- lower risks by increasing the accuracy of forecasting, timely detection of various anomalies.

There is no doubt that artificial intelligence will be able to take on the routine administrative functions of management - coordination and control. In addition to that intelligent machines have an undeniable advantage over human intelligence in the Big Data analysis, the study of various event scenarios and modeling of various business processes. In other words, artificial intelligence will be indispensable in the strategic analysis of different factors of the macro- and microenvironment of the organization, the analysis of its strengths and weaknesses, opportunities and threats, analysis of the corporate portfolio. However, not everything is so simple with the interpretation of analysis results and strategic decision making.

II. ARTIFICIAL INTELLIGENCE – DEFINITION AND CLASSIFICATION

Currently, AI is a general term that combines many more specific concepts, such as computer vision, neural networks, machine learning, etc. Artificial Intelligence (AI) could be defined as a computer program which can perform various cognitive tasks like a human [6]. AI is used in different sectors of economy such as transport, healthcare, finance and others.

In modern science, it is customary to distinguish three types of artificial intelligence:

- limited artificial intelligence. This type of artificial intelligence is designed to solve only one specific problem - to recognize objects, play chess, etc.;

- general artificial intelligence, capable of performing several different tasks;

- supramental artificial intelligence that surpasses the capabilities of human intelligence.

Fig.1 shows the Artificial Intelligence classification in terms of its application.

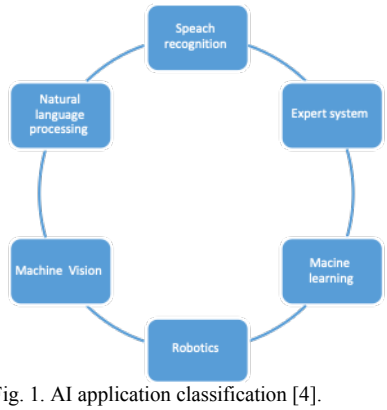

Fig. 1. AI application classification [4].

Expert system could be considered as an AI which is able to solve different types of problems. Machine Learning is an ability of an AI to improve its algorithms automatically by means of processing new data. Natural Language Processing is usually combined with Speech Recognition and could be considered as an ability to understand and analyze human language. Machine Vision is an Artificial Intelligence which is designed to use its algorithms for image analysis [6].

In terms of application AI systems are used in :

- Customer service;
- Research & Development;
- Data analysis & forecasts;
- Knowledge management;
- HR management;
- Banking and finance;
- Logistics;
- Marketing;
- Healthcare;
- Etc.

III. Artificial Intelligence in Strategic Decision Making

In modern science there are two main approaches to strategic decision-making process [1]:

- rational approach based on the implementation of various methods of strategic analysis and the choice of one or more strategic alternative based on logic or mathematical methods. The result of this approach is an objective solution that takes into account many different factors and their influence on the problem;

- an intuitive approach based on a personal subjective judgment skill as a result of certain associations, practical experience, creative imagination and implicit learning.

Since the process of making a rational strategic decision can be decomposed and an algorithm for choosing the most effective solution from several alternative options can be created, we can say that Artificial Intelligence will be indispensable in making rational strategic decisions.

However, there are many situations where a rational approach to strategic decision making cannot be used as the only one - it is necessary to use an intuitive approach. And since it is often based on the emotional perception of various factors, experience and evaluative judgments skills, it is not possible to draw up an algorithm for making intuitive decisions. This means that artificial intelligence is not capable of making intuitive strategic decisions.

Also, artificial intelligence is not able to think abstractly, go beyond the framework established by the algorithm in forecasting or generating ideas.

In addition, Artificial Intelligence is not able to analyze the context. Quite often there are situations when information alone, even if its large array, is not enough to make a strategic decision, or this information is quite contradictory. In this case, human intelligence is able to take into account the historical, cultural or interpersonal context but AI is not capable of this.

Fig. 2 shows the factors of the business environment which affect the strategic decision-making process.

The uncertainty factor is the impossibility of predicting the future with one hundred percent probability, since it does not seem possible to analyze the entire amount of information regarding all factors of the micro- and macroenvironment that affect the organization [6].

The complexity factor is associated with a sufficiently large number of elements that affect a particular situation, which means the need to analyze a significant amount of data [6].

The ambiguity factor is associated with the possibility of the existence of several completely opposite interpretations of various facts that affect one or another event (6].

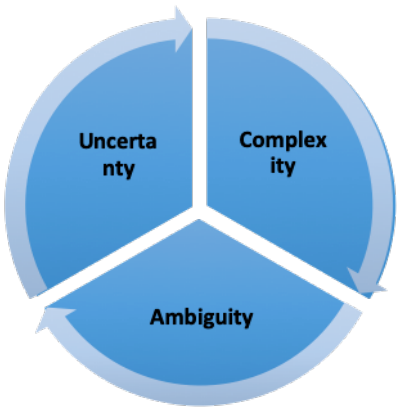

Fig. 2. Environment factors that affect strategic decision-making process *(prepared by authors)*

That is why in situations of ambiguity and uncertainty artificial intelligence will face certain difficulties in making the right rational strategic decision, but in cases of complex multifactorial influence on a particular situation, artificial intelligence will have a significant advantage over the human mind.

IV. Research Methodology

During this study a combination of primary and secondary research was used. In the first stage the authors used the secondary research collecting a data massive from independent studies, technical magazines and paid data sources. The results of the first stage are the basis of the authors estimations

In the second stage of the study the authors used the primary research by means of Delphi method collecting data from Key Industry Participants regarding the usage of artificial intelligence in strategic decision making.

The main goal of the primary research was to verify our estimations in terms acceptability and to collect more data regarding the future expectations about the usage of artificial intelligence in strategic decision making.

V. Findings

During our research the interviewed experts gave us completely different views on the leading countries in terms of AI development. They all agree that the leading pool consists of USA, China, South Korea, Japan and some European countries (most often UK and Germany were mentioned). However, experts rank these countries according to completely different criteria - the number of projects of AI developments or profitability or certain industry.

To analyze the prospects of using AI for strategic decision-making process it is important to discover if managers are ready to transfer this job function to AI. Fig. 3 demonstrates that only 24% are ready to do this.

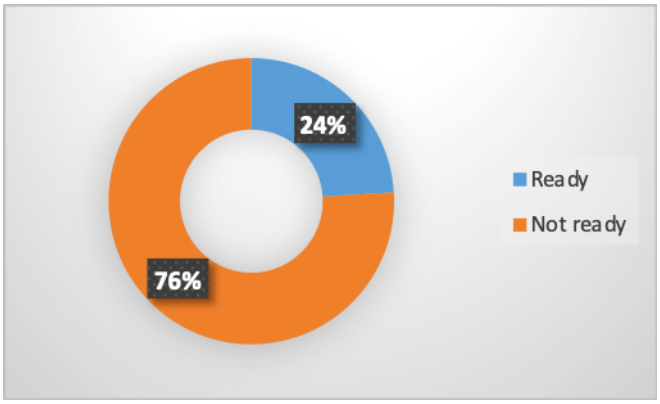

Fig. 3. Share of managers who are ready to transfer strategic decision-making process to AI *(prepared by authors)*

Fig. 4 shows the ratio of conditions under which managers are ready to transfer strategic decision-making process to AI.

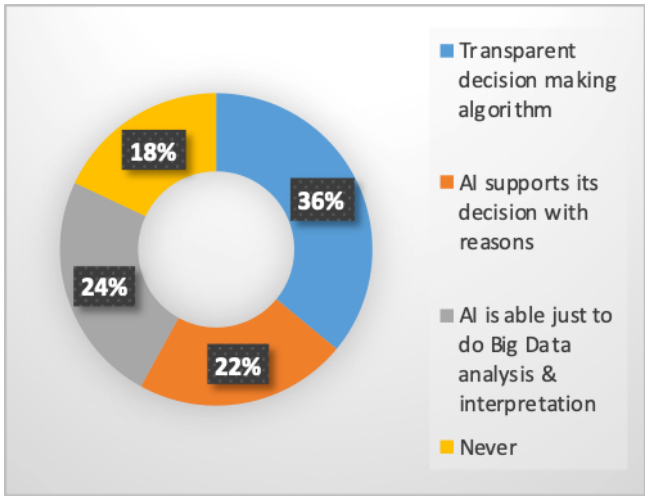

Fig. 4. Conditions under which managers are ready to transfer strategic decision-making process to AI *(prepared by authors)*

Main approaches for making managerial strategic decision are highlighted on the Fig. 5. 42% of the respondents use rational approach for strategic decision-making process, 32% use their own experience and 26% use intuitive approach.

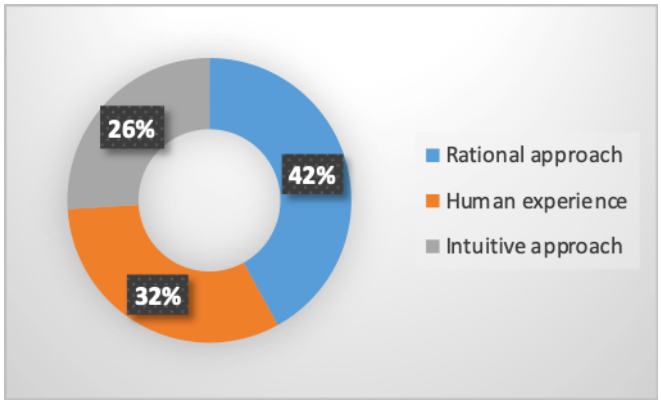

Fig. 5. Main approaches for managerial strategic decision making *(prepared by authors)*

VI. Discussion and Conclusions

According to experts, the leaders in terms of use and development of Artificial Intelligence are IT companies, banks and retail. According to Figure 3 only 24 % of managers are ready to transfer strategic decision-making job function to AI. The main reason of such a result is lack of understanding of Artificial Intelligence decision making algorithms and strong beliefs that AI can perform just Big Data analysis and interpretation (see Figure 4). This approach could be considered as the right one to some extend because AI strategic making process is based just on rational approach, but such skills like abstract thinking, intuition and analysis of the context are not available to the intelligent machine. Abstract thinking helps human to work on the basis of various concepts that go beyond the existing frame of the reality. Context analysis helps human to make strategic decisions when he has a lack of information or in conditions of inconsistency of this information. Intuition is an ability to make decisions without rational thinking and logic just using combination of emotions, feelings and previous experience [7]. According to Figure 4 26 % of managers use their intuition in the strategic decision-making process.

Thus, the combination of both approaches — rational and intuitive — seems to be the most effective method for making strategic decisions. With such a combined method, the intuitive decision is subsequently checked by means of a rational approach and, if necessary, adjusted. Therefore, the most effective way of a strategic decision-making process could be considered the cooperation of the human being and artificial intelligence, when a person uses an intuitive approach to make a strategic decision, and a rational one uses artificial intelligence.

Fig. 6 demonstrates a diagram of joint strategic decision-making process by humans and Artificial Intelligence. At the first stage, human poses a problem for Artificial Intelligence. The second stage consists in the analysis by the AI of the entire data array related to the problem in accordance with the algorithm, either created by human, or generated by Artificial Intelligence by means of deep machine learning.

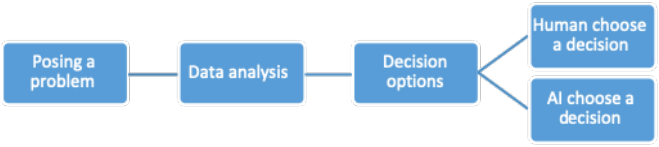

Fig. 6. Algorithm of collaborative strategic decision-making process *(prepared by authors)*

At the third stage, human is offered several options for solving the problem developed by the artificial intelligence. And then a human has a choice - either he makes a strategic decision on his own or gives the decision to the Artificial Intellect or adjust AI's algorithm in order to get other options.

The strategy development manager needs to develop skills that facilitate the adoption of intuitive strategic decisions — creative thinking, abstract thinking skills, the ability to analyze context, and not just facts.

Regarding main challenges of AI usage in the strategic decision-making process we have to mention the problem of ethics– while making strategic decisions managers take into account various ethical aspects and human values which could not be encoded for the intelligent machines' usage.

Another challenging aspect of the AI usage for the strategic decision-making process is responsibility. In fact, only humans can be responsible for their decisions, but not a machine, even intelligent machine. This challenge leads to another one – legal regulatory of the AI's strategic decisions. Autonomous Artificial Intelligence can't be responsible for it's decisions towards the law and could not be blamed for them [8]. So, in order to create regulatory framework for harm or damage caused during the operation of Artificial Intelligence systems, it is required unambiguously define the concept of Artificial Intelligence and establish its status in civil law relations.

Thus, the use of artificial intelligence in the process of developing a strategy will lead to the fact that artificial intelligence will be considered as a colleague, able to help analyze a significant amount of data, develop the most rationally effective options for solving various strategic problems and even adopt the most efficient rational solutions in cases where a rational approach seems to be most preferable.

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