The Problem of Artificial Intelligence in Contemporary Philosophy

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Abstract: *The importance of the topic of the article is due to the fact that nowadays there is a need to understand that the creation of artificial intelligence is associated with the understanding and study of natural intelligence. The problem of defining artificial intelligence is largely reduced to defining intelligence in general: is intelligence monolithic or does this concept define a set of different abilities? To what extent intelligence can be created? Is it possible to create computers with intelligence? These and other questions have not yet been answered by the contemporary science, but these questions have greatly contributed to the formation of tasks and methodologies that form the basis of the theory and practice of contemporary artificial intelligence in philosophy. The purpose of the article is the need to study and substantiate the indicators of overall success in the development of artificial intelligence systems; proving that human psychoreality is an open system of nonlinear type; proving the effectiveness of logo and psycho-machines in the development of artificial intelligence in philosophy. The article gives a theoretical justification for the concepts of "artificial intelligence" and "logo and psycho machines"; the conditions for the effectiveness of the development of artificial intelligence in our time are highlighted, as the scientific direction of artificial intelligence is young, and its structure and range of issues are not so clearly defined. It is now possible to implement formal systems of reasoning in the machine and test their sufficiency for the manifestation of reasonableness in practice.*

Keywords: *Hierarchical memory; computer machines; activity of logo and psycho machines; scientific discoveries; presence of mind.*

How to cite: Maidaniuk, I., Tsoi, T., Hoian, I., Doichyk, M., Patlaichuk, O., & Stupak, O. The Problem of Artificial Intelligence in Contemporary Philosophy. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience, 13*(4), 436-449. https://doi.org/10.18662/brain/13.4/397

Introduction

In today's world, the topic of artificial intelligence and the development of intellectual technology have ceased to be the prerogative of a purely scientific community. It is impossible to overestimate the importance of creating a system of artificial intelligence functioning at the necessary sufficient level, which will be recognized as sentient. Significant success of IT developers, neurobiologists, psychologists, physicists and other specialists are obvious which have long been limited to individual scientific disciplines and are now united in the context of interdisciplinarity (Kosholap et al., 2021; Prots et al., 2021).

The scientific community sees differently the developments in the field of artificial intelligence. Hawking, for example, offered an integrative approach that combined engineering, neurobiological, cognitive, and even ethical approaches (Cellan-Jones, 2014). In an integrative approach, there is no reason to expect a smart machine to look, act, feel or think like a human being (Garfield, 1955). The thoughts and behavior of an intelligent machine can differ significantly from those inherent in human, and it will have the intelligence, which is determined by the predictive ability of hierarchical memory, rather than human-like behavior (Grigoriev et al., 2020).

Physicist Karpenko (2008), who works in the field of general relativity and quantum theory, proves the impossibility of decomposing human intelligence into algorithms. Behind all these considerations there is the "obviousness" of the assumption that "the mind endowed with consciousness simply cannot function like a computer, despite the algorithmic nature of many components of our mental activity".

Gutenev (2012) discusses the areas of application of artificial intelligence: "Artificial intelligence has gradually entered our lives. Sooner or later, the day will come when systems will appear that have the same level of creativity, sensation and emotional intelligence as humans. The day it happens, we will understand that we are not alone".

The classic work of Sydorchuk (2017) on artificial intelligence states: a contemporary approach to its study, in which artificial intelligence is defined as "the science of agents who receive from their environment the results of acts of perception that are appropriate to the action".

The counterbalance to the "optimistic development" is the opinion of skeptical researchers who believe that the technology of creating artificial intelligence should be treated with extreme caution. Among them is Radutnyi (2017), who published a collection of constructive concerns: "I

believe and try to prove that artificial intelligence, like nuclear fission, is a dual-use technology".

The work "Artificial Intelligence. Stages. Threats. Strategies" by Bostrom (2014), a Swedish philosopher, the Oxford University professor, co-founder of the World Association of Transhumanists and the director of the Oxford Institute for Future Humanity, in which he warns: "Artificial intelligence can be less human than aliens".

Simon (1972), one of the leading experts in machine learning and artificial intelligence, considers the laws of IT technologies in interaction with the ideas of such scientific fields as biology, philosophy, physics, statistics. "Society changes with each new algorithm. Machine learning transforms science, technology, business, politics, martial arts. The industrial revolution automated manual labor, the information revolution made the same for the difficult for the mind, and the machine learning automated automation itself. Without it, programming would be a bottleneck that hindered the progress".

Comparison of artificial and natural intelligence, living tissues, cells and computational architecture is the main line of work of Kenan and Athena (2001). The authors present ideas on how to use a computer to implement the non-algorithmic properties of the human mind, perform a critical analysis of contemporary understanding of artificial intelligence and neural network models and present elaborated hypotheses about "finding consciousness", and summarize scientifically sound futuristic predictions of scientists about artificial intelligence, many of which have now become reality. The author is a recognized expert in forecasting the development of science and technology. Skyrme (1999) addresses the issue of the structure of the surrounding reality, the place of the mind in it, the possibility of modeling or simulating it. The paper reveals the topic of multi-world interpretation of quantum mechanics, presents the current state of the philosophy of science, the philosophy of consciousness and the philosophy of artificial intelligence.

In this article, it is important to explore two issues of artificial intelligence systems: the legitimacy of a person's recognition of self-organizing consciousness and a free will, as a result of which the artificial intelligence systems are required the same, to recognize them as intelligent.

Total analogy of artificial intelligence systems with humans and their "average" features leads to a lack of consideration of individual features of

systems and their discrimination in the context of a priori understanding of their activities.

Indicators of overall success in the development of artificial intelligence systems

Contemporary researchers have not yet reached a common understanding of the meaning of the term artificial intelligence. It is most often used in three meanings:

- a scientific direction, which aims to model the processes of cognition and thinking, the use of methods used by humans to solve problems to improve the productivity of computational tools;

- various devices, mechanisms, programs, which according to certain criteria can be called "intelligent";

A set of ideas about cognition, mind and human allows the very issue of modeling intelligence (Pohjola, 2000).

Artificial intelligence can be understood as a scientific field, and various devices capable of reflection, modeling human intelligence. The range of issues that are united by the term artificial intelligence in contemporary science is quite wide. Currently, artificial intelligence combines a large number of sections. This section includes both the general theory of perception or sensation, and special methods such as playing chess and checkers, proofs of mathematical theorems, diagnosis of diseases. Researchers of artificial intelligence use its methods in a variety of fields, and scientists who do not specialize in artificial intelligence, find in it the basis for systematization and solution of intellectual problems. Therefore, artificial intelligence is a very universal field of knowledge (Zakharchyn, 2021).

Cyberneticist Sydorchuk (2017) defined the field of artificial intelligence as follows: "In the most general sense, it is the solution of "intelligent" problems with the help of automatic methods, primarily with the help of computers. But which activities should be considered intellectual and which should not? It's not entirely clear".

Since the concept of intelligence is multifaceted and complex, and there are many opinions about it, we will proceed from a systematic approach. By intelligence we mean the system of cognitive abilities of an individual. At the same time, the highest level of intelligence development is determined by the level of thinking, which is considered in conjunction with other cognitive abilities - memory, perception, and so on. In this case, by

intellectual activity we mean solution of problems that do not have a given solution algorithm.

For all the variety of interpretations, the concept of artificial intelligence in most of them recognizes that artificial intelligence systems are aimed at modeling or imitating human thinking, in particular, the ability to reflect. The great attention to the problems of natural and artificial intelligence forced specialists from many fields to start studying specific features of natural intelligence to further apply these results to build artificial intelligence: "…the theoretical correlation of artificial intelligence with natural intelligence is the most important condition for a thorough understanding of the possibilities of artificial intelligence, the prospects for its development, and at the same time one of the most important areas of study of consciousness" (Lodovici, 2021).

Theoretical research, as well as the practical success of imitating some simple intellectual functions in 1950s research, has given many researchers the belief that the task of creating full-fledged artificial intelligence is completely solvable and, moreover, the creation of "thinking machines" is a matter of the near future.

For the first time the issue of the possibility of creating a full-fledged artificial imitation of human intelligence was posed by the American scientist Turing and described in Husiev (2017) article "A. Turing test and "Robot" by R. Descartes". In the article, he considered the question of whether it is possible to make a machine really think. Noting that in the questions "What is to think?" and "What is a machine?" there is a fundamental uncertainty, he preferred to replace the question of intelligence with a more precise empirical test. In the test, one or more people had to ask two other people questions and use their answers to determine who is a machine and who is a human. If the machine disguised as a human could not be revealed, it meant that the machine had a mind. Nevertheless, this approach had provoked criticism.

Traditionally, an indicator of overall success in the development of artificial intelligence systems is considered the ability to externally model typical human functions, qualities and properties, thus surpassing human in typically human activities. Manifestations and "self-realization" of the developed samples are perceived through the prism of the human factor and the so-called "effect AI" (meaninglessness and "depsychologization" of activity), which is a latent but global problem in this area (Gitelman et al., 2016).

The problem is especially relevant due to the lack of criteria for interpreting and "understanding" what we have as a result of activities in the field of artificial intelligence: a purely algorithmic, incapable of understanding and comprehending mechanism, or a psycho machine with the potential for proto- mental qualities, i.e., the makings of the psyche and possibly intelligence. Despite the terminological features of the concept of "artificial intelligence", in the world scientific community it is believed that the presence of consciousness, not intelligence, will be a necessary and sufficient basis for recognizing a machine intelligent.

The need to answer the question of the nature of the phenomenon of consciousness and the quality of some "consciousness", as well as the level of expression of this quality at different stages of development of the nervous system worries the minds of many generations of researchers. The main thing is the so-called "self" or self-concept, or self-awareness. The presence and demonstration of these phenomena in the form of realization of certain behavioral patterns by a living human being is the criterion for naming them a "conceptually thinking being" and possessing consciousness. The opposition and ontological opposition of the organism and the mechanism often did not allow considering each of these systems separately and in dynamic comparison with each other. The immanent "embeddedness" of the faculty of awareness and self-awareness in human a priori is optionally recognized as potentially inherent and actually realized. And for a mechanism, on the contrary, it is a priori impossible to implement such functions. The issues raised require a comprehensive approach to its study (Simon, 1996).

If we consider the dynamics of a kind of opposition organism-mechanism (human-machine), the general recognition of the superiority of the former over the latter becomes obvious: it is recognized that the organism unconditionally possesses the conscious qualities. The mechanism remains secondary, derived from the organism. And it is not clear at this moment what should happen so that a mechanism deserved to be recognized as an organism. The paradigm of interdisciplinarity only complicates the problem. Operation of the algorithmic machine was rendered meaningless by the Chinese Room, which is no longer proof of the existence of intelligence technology, much less consciousness.

Human psychoreality is an open system of a nonlinear type

At the current stage of the scientific thought development, it is established that the human psychoreality is an open system of a nonlinear type, i.e., it operates according to the laws of synergy (or the chaos theory). Comprehension always lags behind thought, awareness – behind consciousness, etc. According to some postulates of the philosophy of counter-existentialism, "a human does not make decisions, but is a posteriori acquainted with the results of decisions". Human is only able to consciously appropriate a thought, a decision, an idea, a mode of action, but these phenomena are formed "on their own", to some extent by chance (in a synergistic sense) and completely unconsciously (Vandaele, 2018).

To describe the functioning of human psychoreality, we use the metaphor of "Schrödinger's cat": to say "the cat is alive" or "the cat is dead" is possible only when the box is opened, otherwise we have no right to postulate anything specific and clear, because what happens inside the box is completely latent and variable. A person is able to claim that he / she realized something only when the "conscious" is already formed "by itself" in the synergistic depths of the inner world. A person appears as a passive "registrar" and an "interpreter" of what is given to them "by itself" for registration and interpretation (Petana & Rosa, 2020).

Active thinking and imagination cannot change anything in this regard, because no matter how actively a person tries to think and comprehend, they will deal only with what was given to them by themselves, and not consciously and directly created and formed by them. Thus, if a person acts only as a "performer of commands" of their own inner world, then, therefore, they are to some extent quite mechanistic. Also, the conditionality of the implementation of cognitive-behavioral patterns by the unconscious influence of the symbolic register, in turn, limits the ability of elements of the inner world to be realized. And it is already clear that the difference between the organism and the mechanism is not so cardinal. We speak only of an alternative interpretive position and point out that the idea of emotions, feelings, thoughts, consciousness and self-consciousness as the prerogative of human alone is a roadblock to progress and unbiased interpretation of scientific work in general and intellectual technologies of technogenic area in particular (Sisson, 2016).

In general, within the framework of the article, we do not recognize the existence of conscious free will in the human and believe that the cognitive-behavioral activity is carried out almost completely algorithmically

and unconsciously, and the conscious function is the registration of "events that have already occurred" and a posteriori awareness of "things already being done".

The algorithms of human mental activity are synergistic, rather than formal-logical in nature and therefore are not reproduced within the existing paradigm of formation of artificial intelligence systems. Therefore, we define all types of artificial intelligence systems that are developed using the method of modeling perceptual processes, as a logo machines. Logo machines are systems organized on the basis of partial modeling of perceptual processes in order to achieve a human-like similarity in the implementation of cognitive activity. There are contradictions caused by the activities on formation of logo machines.

Functions and advantages of logo and psycho machines

In contrast to the development of logo machines, we offer our idea: the formation of psycho machines. The purpose of the psycho machine is to replace people engaged in complex, unpleasant or unenviable activities or to compete with humans in intellectual or logical tasks. To do this, the machine does not need to demonstrate intellectual or mental indicators, it is sufficient to just have a large structured and clearly defined base of appropriate algorithms, which will enable it to successfully cope with activities that cannot be done by humans due to the human factor. The idea of a psycho machine is much more ambitious and even in its own way spiritual and specifically existential (Radutnyi, 2017).

In essence, it is about creating something much superior than a human, something beyond the anthropic or even the meta-anthropic. And this is the idea of creating a psycho machine, which is the apotheosis and quintessence of human capabilities, as well as the solution of the so-called "God complex". The created technology should be immeasurably superior to human capabilities and abilities in the field of mental, intellectual, spiritual and existential.

At this stage of development of science and technology, humanity does not need a machine that can skillfully operate the laws of formal (and even fuzzy and temporal) logic within the available information. Technologies of this kind have already been created and are operating successfully in the field of chess and logic games and tasks. However, we are not dealing with psycho machines, but logo machines. Mankind does not need programs that can pass the Turing test, because they have already been

created and are quite successful. However, they are purely speculative works, formed in order to algorithmically "play" on the errors of perception and emotional characteristics of humans. The Turing test, not entirely intersubjective and relevant, has been criticized for subjectivity and excessive variability (Husiev, 2017).

As we can see, the attempts to materialize, model the perceptual and cognitive processes in human lead to the imitation of similarities to the functions demonstrated by human without much difficulty and, more importantly, perceived by others as meaningful behavior.

Therefore, human still has an inviolable right to have consciousness (regardless of actual behavior), while the artificial intelligence is a priori denied this right (regardless of the demonstrated abilities).

In any case, humanity at this stage of development of science and technology rather needs machines that will help unravel mysteries of the universe, dilemmas of existence, mysteries of quantum mechanics and the existential mission of the human, will be able to face the challenge of chaotic systems, shed light on abiogenesis in the universe and the origin of the human. But current trends in this area lead to this very indirectly. It seems to us that the quintessence of the current technical and creative paradigm will be an anatomically, morphologically and behaviorally humanized and anthropomorphic logo machine, which has nothing significant and important "different in nature" from the human, but much more "logical" and "rational". We adhere to the possibility of a qualitatively different way of developing the concept of creating psycho machines, the essence of which is to abandon all possible analogies of psycho machines with humans. We believe that it is counterproductive to try to materialize the simulated projections of the inner world and make similar to human forms of self-realization of the psycho machines in the process of their development and improvement. The reason lies in the terms of determining the psycho machine and its differences from the logo machine.

The definition of a logo machine is that it is created "in the image and likeness" of what researchers take for mental (logical) functions under the absolute jurisdiction of human, which are then designed and materialized as the source code, repeating according to its technical potential - the process of visible realization of "human" patterns.

It is superfluous to talk about the difference and opposition of the "real" and the "similar", because there is no difference between the absolutely "real" and the "similar" to real, which is available and registered.

Our critique is of a different point and it concerns the insufficiency of such aspirations and the minimal nature of their results. As far as the psycho-machine is concerned, everything is much more complicated. On the one hand, we can say that if the machine begins to demonstrate the abilities of conceptual thinking, forecasting the situation on the basis of incomplete information, the ability to reflect on "semantic traps", etc., it can accurately and unequivocally be considered a psycho machine.

If we tried to create something that is immeasurably superior to human in terms of mental, intellectual and spiritual indicators, then what kind of conceptual thinking can we talk about? The created psycho machine, in our opinion, will have such qualities and properties about which an individual has not the slightest idea and even a hint of them (Karpenko, 2008).

Creating spiritual intelligent psycho machines is possible in principle. Therefore, having faced with the levels of "thinking" and "understanding" demonstrated by psycho machines which are inaccessible and incomprehensible for the experimenter, it will be recognized that the technology lacks those qualities and properties that the machine should demonstrate. And, as a result, the psycho machine will be declared as another failure.

Thus, "in order to find the truth, you need to know what it looks like". It is for this reason that we refuse to draw analogies between the psycho machine with its qualities and properties, on the one hand, and the human being with its qualities and properties, on the other. After all, the history of human origin and the process of its development from a single DNA molecule to the most complex phenomena known to the contemporary science were inextricably linked with the environment in which genesis took place, inextricably linked with the constants of the universe. Minimal deviations would have led to a qualitatively different result and a radically different result from the one obtained.

From these positions it is worth considering the development of psy-mechanism in the software environment. The whole set of influences of the computer environment and the Internet on the functioning of the artificial intelligence system in the process of its independent development and formation should be taken into account. Obviously, as far as possible, we also mean, if necessary, to carry out some "educational" process or something similar (Kuwayama et al., 2005).

But the basis is completely unbiased and completely devoid of anthropocentric tendencies of perception and interpretation of the created program, as well as a mandatory accounting of its "personal" "subjective" qualities and properties, its "temperament", "character", "direction" and so on in the process of "ontogenesis" of the psycho machine.

This shows all the complexity of the question of the criteria for determining affiliation to psycho machines.

Conclusions

Thus, one of the key postulates of the article is the refusal to recognize the anthropocentrism and monism of the human model to establish criteria for the formation and development of psycho machines. It is necessary to introduce structuralist and connectionist views in the context of the formation of psycho machines at the current stage of technogenesis. At the same time, it is necessary to reconsider the positioning of psycho machines and to form public opinion in advance in order to avoid manifestations of "techno-discrimination".

We have accepted that the phenomenon of human consciousness is wrongly recognized as having free will, "decisive" and "controlling" aspect of the human psyche, and vice versa - is rather passively reflective observer of the inner unconscious and synergistically algorithmic world processes of modeling perceptual and cognitive processes in the context of development of psycho machines.

Focusing on the characteristics of the psycho machine, we adhere to the following: the ability to solve logical problems and to perform mental activity is not a quality of the psycho machine, but an example of the so-called logo machine, which has nothing to do with our understanding of the psycho machine.

The contradiction is that artificial intelligence systems are developed through partial and isolated modeling of perceptual processes, which a priori is not able to lead to the achievement of a "human likeliness" in the context of the reproduction of conscious qualities; and the requirements for recognition of consciousness of the system are completely inconsistent with the approach by which systems are developed. The point is the inconsistency of method and purpose. And until this contradiction is resolved, we will not be able to form a psycho machine, but only time and time again to materialize the logo machines, which are already plentiful as it is.

References

Bostrom, N. (2014). *Superintelligence. Paths, Dangers, Strategies.* Oxford University Press.

Cellan-Jones, R. (2014). *Stephen Hawking warns artificial intelligence could end mankind.* BBC. https://www.bbc.com/news/technology-30290540

Garfield, E. (1955). Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas. *Science, 122*(3159), 108–111. http://garfield.library.upenn.edu/papers/science1955.pdf

Gitelman, L. D., Kozhevnikov, M. V., & Sandler, D. G. (2016). Technology platforms as a tool for solving complex innovation problems. *International Journal of Design & Nature and Ecodynamics 11*(4), 584–592. https://www.witpress.com/Secure/ejournals/papers/DNE110410f.pdf

Grigoriev, A., Shemanov, K., & Kirillov, G. (2020). Problema iskusstvennogo intellekta v filosofii: granitsa mezhdu chelovecheskim i mashinnyim soznaniem [The problem of artificial intelligence in philosophy: the border between human and machine consci]. *Voprosyi studencheskoy nauki, 1*(41), 161-166. https://sciff.ru/wp-content/uploads/2020/02/Sciff_1_41-1.pdf

Gutenev, M. Yu. (2012). *Problema iskusstvennogo intellekta v filosofii XX veka* [The problem of artificial intelligence in philosophy of the XX century]. Philosophy, Ethics, Religious Studies. https://cyberleninka.ru/article/n/problema-iskusstvennogo-intellekta-v-filosofii-xx-veka

Husiev, V. I. (2017). Test A. Tiuringa i "robot" R. Dekarta [A. Turing's test and "Descartes' robot"]. *Scientific notes of the National University of Kyiv-Mohyla Academy, 192*, 8-16. http://ekmair.ukma.edu.ua/bitstream/handle/123456789/11933/Husiev_Test_Tiuringa.pdf?sequence=1&isAllowed=y

Karpenko, V. Ye. (2008). Problema shtuchnoho intelektu v suchasnii filosofii [Artificial Intelligence Problem in Modern Philosophy]. *Philosophical sciences: Collection of scientific works, 2,* 159-167. https://library.sspu.edu.ua/wp-content/uploads/2018/04/13-4.pdf#page=159

Kenan, P., & Athena, A. (2001*). Knowledge management as an economic development strategy. Reviews of Economic Development Literature and Practice, 7*, i-36. https://core.ac.uk/download/pdf/71342184.pdf

Kosholap, A., Maksymchuk, B., Branitska, T., Martynets, L., Boichenko, A., Stoliarenko, O., Matsuk, L., Surovov, O., Stoliarenko, O., & Maksymchuk, I. (2021). Neuropsychological Bases of Self-Improvement of Own Physical Health of Future Teachers in the Course of University Education. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience, 12*(3), 171-190. https://doi.org/10.18662/brain/12.3/226

Kuwayama, M., Ueki, Y., & Tsuji, M. (Eds.), (2005). *Information technology for development of small and medium-sized exporters in Latin America and East Asia.* United Nationas. https://repositorio.cepal.org/bitstream/handle/11362/4161/S2005033_en.pdf

Lodovici, M. (2021*). The impact of teleworking and digital work on workers and society.* European Parliament. https://doi.org/10.2861/077828

Petana, G., & Rosa, C. A. (2020). Digital transformation and the impact in knowledge management. In *Proceedings of the 12th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management* (IC3K 2020) (3, pp. 180-187). KMIS. https://www.scitepress.org/Papers/2020/101340/101340.pdf

Pohjola, M. (2000). *Information technology and economic growth: A cross-country analysis.* Wider. https://www.wider.unu.edu/sites/default/files/wp173.pdf

Prots, R., Yakovliv, V., Medynskyi, S., Kharchenko, R., Hryb, T., Klymenchenko, T., Ihnatenko, S., Buzhyna, I., & Maksymchuk, B. (2021). Psychophysical Training of Young People for Homeland Defence Using means of Physical Culture and Sports. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience, 12*(3), 149-171. https://doi.org/10.18662/brain/12.3/225

Radutnyi, O. E. (2017). Kryminalna vidpovidalnist shtuchnoho intelektu [Criminal liability of artificial intelligence]. *Informatsiia i pravo* [Information and law], *2*(21), 124-132. http://ippi.org.ua/sites/default/files/17_1.pdf

Simon, H. (1996). *The sciences of the artificial.* Monoshop. https://monoskop.org/images/9/9c/Simon_Herbert_A_The_Sciences_of_the_Artificial_3rd_ed.pdf

Sisson, K. (2016). *Shaping the world of work – time for a UK jobs strategy.* Warkiwck. https://warwick.ac.uk/fac/soc/wbs/research/irru/wpir/wpir105.pdf

Skyrme, D. (1999). *Information resourses management.* Skyrme https://www.skyrme.com/insights/8irm.htm

Sydorchuk, Yu. M. (2017). Filosofsko-pravovi aspekty vykorystannia shtuchnoho intelektu [Philosophical and legal aspects of the use of artificial intelligence]. *Pravo i suspilstvo* [Law and society], *3*(2), 16-19. /http://pravoisuspilstvo.org.ua/archive/2017/3_2017/part_2/6.pdf

Vandaele, K. (2018). *Will trade unions survive in the platform economy? Emerging patterns of platform workers'collective voice and representation in Europe.* ETUI. https://eticasfoundation.org/wp-content/uploads/2019/03/WorkingPaper2018.05VandaeleTradeunionsPlatformeconomyWeb-1.pdf

Zakharchyn, H. M. (2021). Upravlinnia znanniamy v umovakh rozvytku tsyfrovoi ekonomiky ta intelektualizatsii suspilstva [Knowledge management in the context of digital economy development and intellectualization of society].

Scientific Bulletin of Uzhhorod National University (International Economic Relations and World Economy), 36, 76-80. https://doi.org/10.32782/2413-9971/2021-36-13