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IS ARTIFICIAL INTELLIGENCE A THREAT TO THE QUALITY OF HIGHER EDUCATIONAL SERVICES?

The article is devoted to a very important modern problem – the growth of the quality of the higher educational services. The article highlights the situation in the market of the higher educational services with the participation of three players: the consumer of the educational services (students), the provider of the educational services (university teachers) and Artificial Intelligence. The definition of "Artificial Intelligence" is given in the article.

The aim of the article is to find the answer to the research question: is Artificial Intelligence a threat to the quality of the higher educational services?

The author used reliable and economically sound research methods. These were methods such as research of scientific sources; pedagogical observation and description of examples; modelling and forecasting, analysis and synthesis; designing a questionnaire for interviewing students. The author also used the capabilities of Artificial Intelligence in the process of designing the questionnaire to study students' opinions on the use of Artificial Intelligence for learning. A survey of students with verification of statistical hypotheses will give a practical answer to the research question.

The author analyzed the scientific views of scientists on the use of Artificial Intelligence in education and, in particular, in higher education. Three examples of the use of Artificial Intelligence in the higher education services were analyzed for threats to the quality of the higher educational services.

Four hypothetical variants of the interaction of three players in the market of higher educational services were analyzed: the consumer of educational services (students), the provider of educational services (university teachers) and Artificial Intelligence. This was the theoretical answer to the research question: in two variants out of four (50%), there is a threat to the quality of the higher educational services.

Keywords: Artificial Intelligence, vocational training, educational services, quality of educational services, threats to the quality of educational services, consumer of educational services, provider of educational services.

Introduction. The definition "artificial intelligence" (AI) appeared in 1956, but today AI has become more and more popular due to increased data volume processing, improved algorithms and increased computer's power and memory. This refers to software technologies that force robots and computers to do human work (Sartori and Strazzer, 2020).

Artificial intelligence (Artificial intelligence, 2022) is:

- the science of using computers to do things that humans can do,
- the study and development of computer systems that perform tasks that previously required human intelligence.

Thus, Artificial Intelligence is a computer or computer system that performs any kind of intellectual work together with a person or instead of a person.

A computer can be embedded in a humanoid robot (*The Machine*, 2022; *A.I.*, 2001; *The Terminator*, 1984) or another device for solving intelligent problems (programmable calculator, taxi without a driver, cameras and facial recognition system).

A computer system (network) can function without an image that we see with our eyes (Scopus

classification system; excel tables; Google search engine). One more example is Skynet network (*The Terminator*, 2003).

In this research, we study some aspects of the application of AI in higher education.

In the 70s, the belief in the possibilities of artificial intelligence was the belief that everything that is necessary for human intelligence can be formalized. Initially, artificial intelligence did not correspond with the initial human expectations regarding pattern recognition and problem solving (Hubert, 1974).

A very important article of Wilson, Kuperman, Crawford, & Perez (1988) was about the first step in the construction of a human factor tool for evaluating artificial intelligence. The study of ratings showed that human expectations related to the educational aspects of AI were at the lowest importance ratings.

Today, the use of Artificial Intelligence is divided into approximately two directions for colleges and universities (Pence, 2019):

- Firstly, AI is used to analyze data collected in learning management systems and other academic data repositories to improve their using and storage the information.
- Secondly, these are programs that primarily concern the management of the educational institution. AI is used for marketing, recruitment of personnel, determining financial aid for students and employees, and answering frequently asked questions.

Artificial intelligence will create new challenges and new opportunities for teachers. Attempts to meet AI with the existing curriculum may be unsuccessful. Therefore, civilization may miss good chances to bring higher education to a new level (Pence, 2019).

The aim of the article is to find the answer to the research question: is Artificial Intelligence a threat to the quality of the higher educational services?

Object of research: Artificial Intelligence on the higher educational services market.

Subject of research: possible threats to the quality of higher education services from Artificial Intelligence.

Methods. The author used reliable and economically sound methods. These were empirical methods: research of scientific sources; pedagogical observation and description of examples; modeling and forecasting, analysis and synthesis; designing a questionnaire for interviewing students.

In the research on the use of AI in higher education, the author used the capabilities of AI.

Examples of the use of AI in higher education according to Pence (2019).

The author's first experience in using AI was obtained in the early 90s. This was the first direction of using AI in universities (Pence, 2019). The author's results on the use of Artificial Intelligence for higher educational services were published for the first time in 1992.

It was the use of a computer program to test students' knowledge. The program worked this way:

Step 1. The student received 5 questions. Each question had 5 possible answers. The responses were divided into three groups. One answer was correct. Two answers were almost correct, but not completely. And two of the answers were absolutely wrong.

Step 2. For the correct answer, the student received 1 point. For an almost correct option, the student received 0 points. For choosing the wrong option, the student received a negative mark. It was -1 (minus one) point. At the same time, the program wrote the answer from which group the student chose.

Step 3. The program gave the student the opportunity to answer before choosing the correct answer. If the student immediately gave the correct answer, he received 1 point for 1 question. If a student gave an incorrect answer or an almost correct answer, the program added 0 points according to the algorithm or subtracted one point. The program selected 5 questions for the student by generating a random variable. The innovation was the principle: the student continued to answer until choosing the right answer. Therefore, during the exam, the learning process continued. Thus, the computer program performed the former intellectual work of a university teacher. Artificial Intelligence controlled the level of knowledge and taught the student.

The author does not see AI as a threat to the quality of higher educational services. This example changes the subjective approach of university teachers to the assessment of students' learning outcomes. This example challenges inefficient traditions of knowledge control in favor of efficiency and objectivity.

The author met a system for evaluating the results of scientific work using AI at the Pedagogical University in Krakow in 2017–2018 (Figure 1).

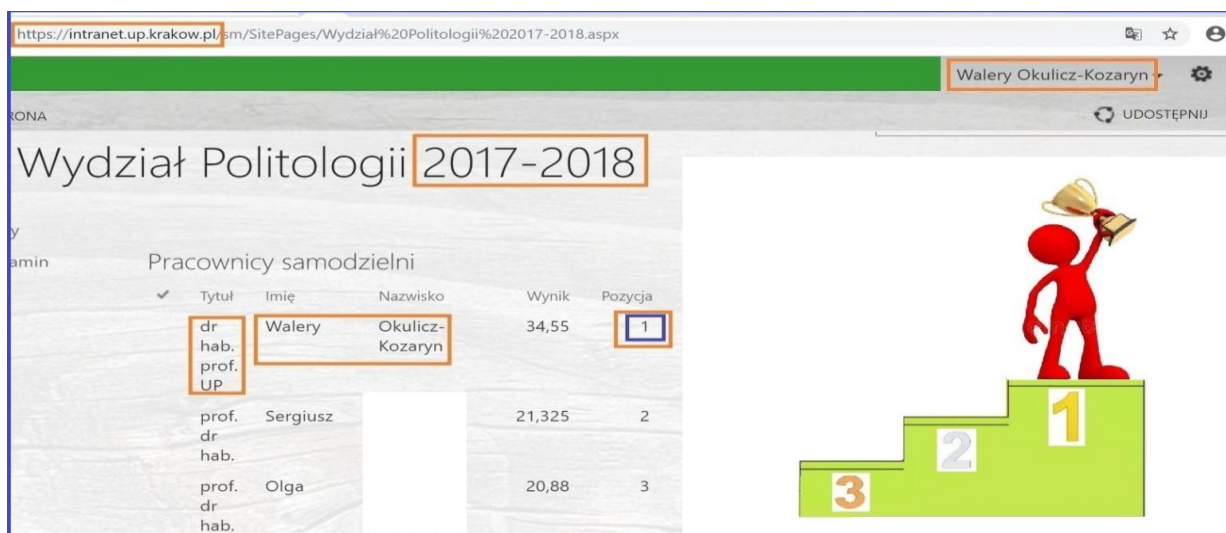


Figure 1. Screenshot of the rating with the results of scientific work of university teachers of the Pedagogical University in Krakow

Figure 1 showed the second example to use AI in higher education. It is the final result of the evaluation of efficiency of scientific work. Each scientist independently enters his scientific achievements into the system:

- the number of published articles;
- the number of conferences in which he participated;
- participation in the implementation of scientific grants and projects, etc.

Responsible employees of the university check each figure in the performance criteria in their field of responsibility. So, no one approves of a digital rating to evaluate scientific results.

The author does not see AI as a threat to the quality of higher educational services. This example changes the commission-subjective approach to the evaluation of scientific results. This example challenges inefficient traditions in favor of efficiency.

Example 2 is very important for universities. It has been proved that modern consumers of educational services use the criterion "the number of highly qualified personnel (professors)" when choosing a university to study (Tarasava and Okulicz-Kozaryn, 2021). In other words, highly qualified personnel (professors) are the most important player in the market of higher educational services (Malovychko, 2023).

At the Higher School of Business – National Louis University, artificial intelligence is used in the educational process since 2019. In the third example the module based on artificial intelligence algorithms supports professors (Okulicz-Kozaryn and Woźniak, 2023):

- preliminary quality control of completed tasks;
- control of plagiarism for groups of 50 to 1500 students;
- since 2022 also the detection of answers prepared based on GPT chat.

The module based on artificial intelligence algorithms also supports students (information about the way they study).

The information collected in the system since 2015 also allows the study of student behavior and the improvement of study programs (Okulicz-Kozaryn and Woźniak, 2023).

Thus, it was described the fourth example to use AI in higher education. Here you can see the efforts of university teachers and university authorities to fight against the illegal use of AI by students. Here the author sees potential AI threats to the quality of higher educational services.

Thus, the author showed 3 examples of how AI was used in each of the directions of its application in higher education (Pence, 2019). The spread of AI technology will require changes both on the part of students and university teachers, as well as in teaching methods. In reality, there are a lot of examples. And you don't know the real ratio of cases when AI poses a threat to the quality of higher educational services.

Thus, these 3 examples are enough to see that AI technologies challenge traditional higher education (Pence, 2019) and threat to the quality of higher educational services.

Possible schemes of AI participation in higher educational services. In this part, the author drew possible schemes of AI participation on higher educational services market. As shown in the article of Okulicz-Kozaryn (2022), before the advent of AI on the educational services market, there were 2 players on the market (Figure 2).

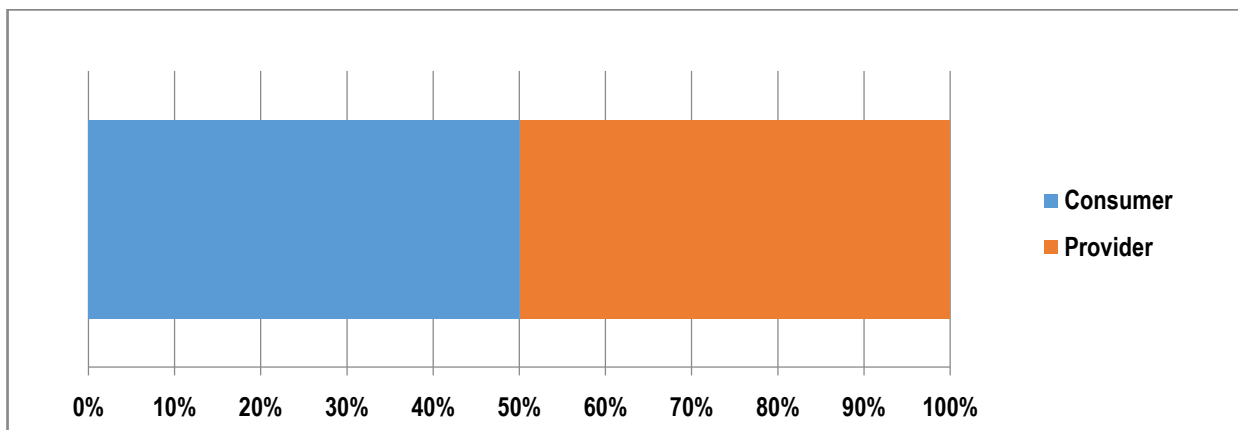


Figure 2. Two players on the educational services market before 2017

Source: designed by the author

Figure 2 shows that the consumer of educational services (student) and provider of it (university teacher) were the players on the educational services market before 2017. Figure 2 shows a high-quality picture. This is a picture without quantitative data.

According to article (Okulicz-Kozaryn, 2022), a new player has appeared on the educational services market in 2017. Artificial Intelligence is this player.

Hypothetically, there are 4 possible options for the interaction of the consumer of educational services, the provider of educational services and Artificial Intelligence (Figure 3, Figure 4, Figure 5, Figure 6).

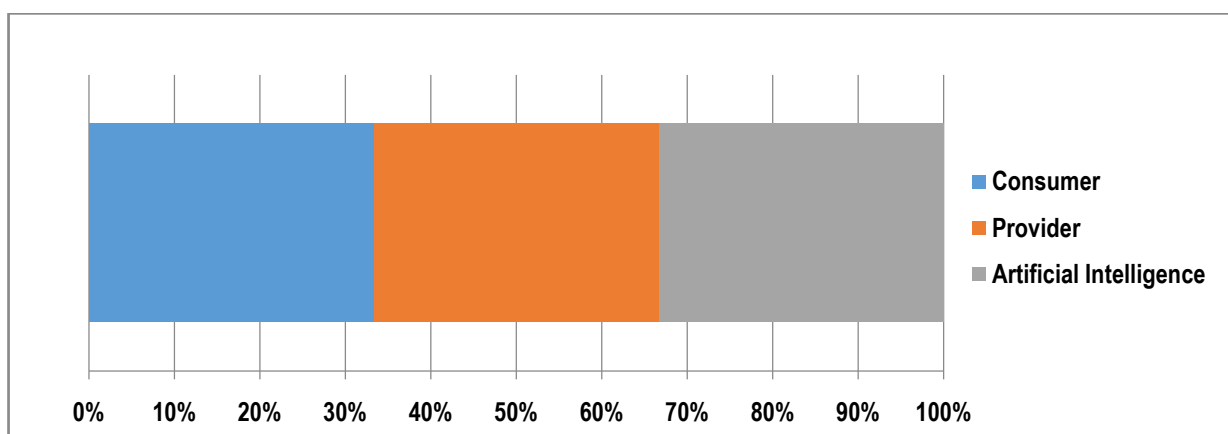


Figure 3. Three players on the educational services market after 2017

Source: designed by the author

Figure 3 shows a seemingly perfect picture. Artificial Intelligence is on the side of university teachers on the higher educational services market. University teachers use AI to improve the quality of higher educational services. The author does not see AI as a threat to the quality of higher educational services.

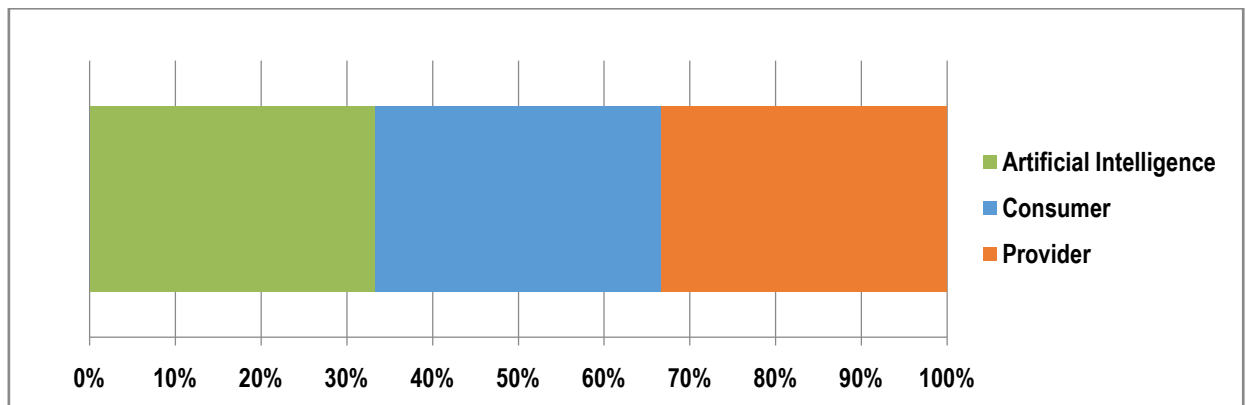


Figure 4. Three players on the educational services market after 2017

Source: designed by the author

Figure 4 shows a less pleasant picture. Artificial intelligence is on the side of students on the market of higher education services. Students illegally use Artificial Intelligence to improve their grades. In particular, they use AI to get correct answers during tests and exams. The author sees AI as a threat to the quality of higher educational services.

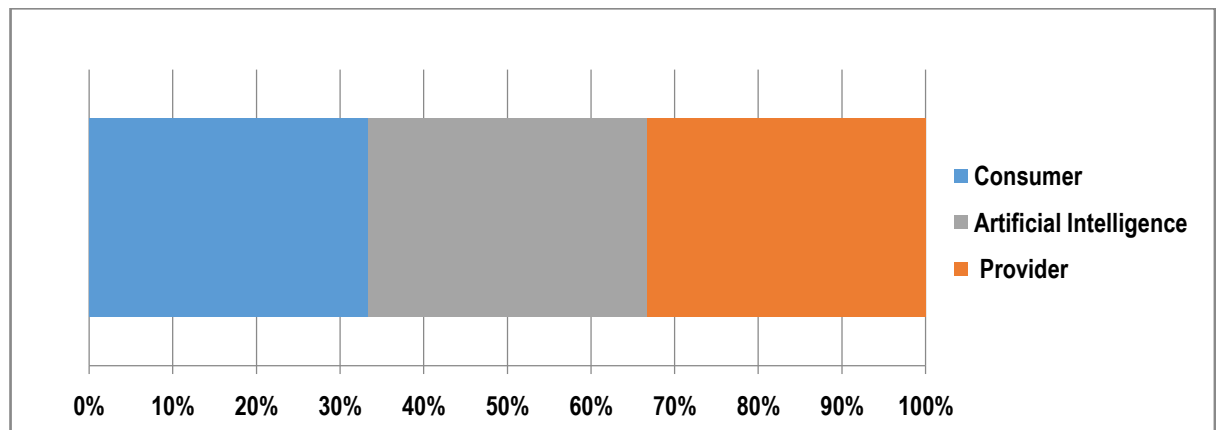


Figure 5. Three players on the educational services market after 2017

Source: designed by the author

Figure 5 shows the saddest picture. Artificial intelligence exists between students and university teachers on the market of higher education services. AI divides students and university teachers into two opposing camps.

University teachers are trying to use AI to increase the quality of educational services. Students, in turn, illegally use Artificial Intelligence to improve their grades. In particular, they use Artificial Intelligence to get correct answers during tests and exams.

University teachers and university authorities are forced to spend time and intellectual resources to combat illegal activities of students. They are forced to make managerial decisions to prevent the illegal use of AI by students. The author sees AI as a threat to the quality of higher educational services.

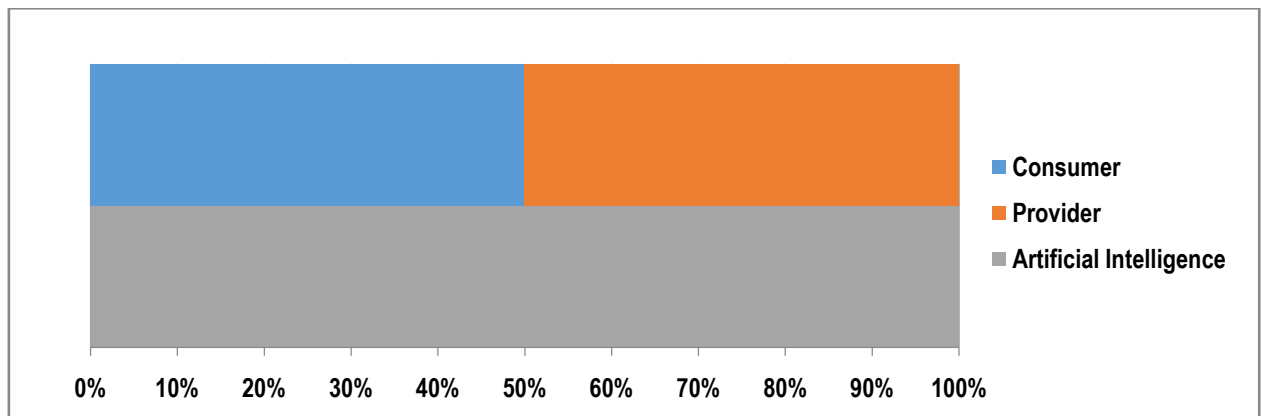


Figure 6. Three players on the educational services market after 2017

Source: designed by the author

Figure 6 shows the perfect picture. Here AI unites students and university teachers. Both traditional players on the higher educational services market have equal access to AI.

Artificial Intelligence does not separate consumers and providers (Figure 6). AI provides both students and university teachers with additional intellectual resources to increase the quality of higher educational services. The author does not see AI as a threat to the quality of higher educational services.

In the above examples, Artificial Intelligence played on the provider's side 2 times. In the third example, AI plays on the student's side against the quality of educational services. You understand that AI is just a tool in the hands of students. However, this is already a threat to the quality of higher educational services.

Unfortunately, you do not have an exact knowledge of which option (Figure 3, Figure 4, Figure 5 or Figure 6) is taking place today. You know for sure that Figure 2 is no longer working. And you cannot say with absolute certainty which figure dominates on the higher educational services market: Figure 3, Figure 4, Figure 5 or Figure 6?

Theoretically speaking, there are 50% that AI technologies threaten to the quality of higher educational services. To make the situation clearer, you need to know, at least, the opinions of students. So, in the third part, the author gave a questionnaire to assess students' opinions on the use of AI on the higher educational services market.

A questionnaire to assess students' opinions on the use of AI in higher educational services. The design and preparing of the questionnaire for the survey of students were carried out in 4 stages.

At the first stage, the student of the MBA program prepared questions for the survey of students. He also prepared the answers and the metric. At the same time, the author of the article asked Artificial Intelligence (<https://chat-gpt.org>) to prepare questions for such a questionnaire.

At the second stage, the author of the article summarized the questions prepared by the MBA student and Artificial Intelligence. On their basis, the author of the article prepared a questionnaire to study the students' opinions on the use of AI in higher education.

At the third stage, Professor of Psychology, Doctor habil of Psychological Sciences, Head of Department of Psychology and Sociology checked and corrected the questionnaire questions and the metric.

Finally, at the fourth stage, the author translated the questionnaire into English and Polish. After that, the author attached the questionnaire to CloudA of National Louis University. This cloud automatically generates the excel tables during surveys.

Thus, in the research the opinions of students on the use of AI in higher education, the author used the capabilities of Artificial Intelligence.

The questionnaire for the survey of students has 3 sections.

The first section contains an appeal to students. Considering that the survey is anonymous and voluntary, the text of this section is very important. The appeal to potential respondents sounds like this:

"Dear Colleague, please write down your answers in a simple questionnaire. It will take less than 5

minutes and will help you understand your personal attitude to Artificial Intelligence (AI). The survey is voluntary and anonymous. By answering questions, you are participating in the creation of a new future. Please click the blue "Save Questionnaire" button after filling out the questionnaire. Thank you for your time."

The second section contained metric data (Griffiths, et al., 2017). The second section includes such metric data as: gender, age, level of education, country of residence. The data "Gender", "Age" and "Level of education" are filled in according to the standards accepted in the EU. The "Country" data is filled in according to the respondent's country of residence at a given time. This is accepted because the questionnaire is in electronic form. Many respondents may live in one country and study in another.

The third section contains the main questions concerning students' opinions on the use of AI in higher education. The students' answers should explain which figure dominates the higher educational services market. Is there the scheme shown on Figure 3, Figure 4, Figure 5 or Figure 6?

The third section contains 8 single-choice questions and 1 multiple-choice question.

The multiple-choice question is: In what situations during learning do you use Artificial Intelligence?

There are 5 replies:

- Answering Tests / Exams,
- Presentation of research results,
- Preparation and presentation of learning results,
- Translation of texts,
- Do not use.

This is the key question that will help to make the situation clearer. After interviewing students, you will know:

- how many percent of students do not use AI in the educational process,
- how many percent of students use AI for presentations of learning results,
- how many percent of students use AI during tests and exams.

The remaining 8 questions concern students' opinions on other aspects of the use of Artificial Intelligence on higher educational services market.

The CloudA of National Louis University allows you to see the students' answers graphically. At the same time, you will receive this data in the form of excel tables. Excel tables, in turn, make it possible to calculate statistical indicators: the expected value (\bar{X}), the average for the sample ($\bar{\delta}_x$) and the average for the population ($\bar{\delta}_{x-1}$). These indicators are used in the verification of statistical hypotheses (Singpurwalla, 2015) in order to transform the array of subjective opinions of students into strict scientific knowledge.

To begin with, you check how many percent of students use Artificial Intelligence for tests and exams. If this figure is statistically zero, then students do not use Artificial Intelligence for tests and exams (Figure 3 or Figure 6). If this figure is statistically different from zero, then students use Artificial Intelligence for tests and exams (Figure 4 or Figure 5). This means Artificial Intelligence it poses a threat to the quality of higher education services.

The statement «Preparation and presentation of learning results» is checked in the same way.

Ultimately, the survey of students and the verification of statistical hypotheses will show a clear answer to the question: in what situation (Figure 3, Figure 4, Figure 5 or Figure 6) are the three players on the higher educational services market?

The theoretical significance of the article is in the presentation and analysis of 4 hypothetically possible options of the interaction of the consumer of educational services, the provider of educational services and Artificial Intelligence (Figure 3, Figure 4, Figure 5, Figure 6). It is theoretically justified that in 50% of the variants AI is a threat to the quality of higher educational services.

The practical significance lies in the analysis of examples of the use of AI in higher education. It is shown that there are examples with a threat to the quality of higher educational services.

The methodological significance is in the preparation of a questionnaire for interviewing students and clarifying the situation: is Artificial Intelligence a threat to the quality of the higher educational services?

This research has great social significance. The author raised the issue of the interaction of the consumer of educational services, the provider of educational services and Artificial Intelligence. In particular, it was a question of the quality of higher education services. This topic is very important for

students, university teachers and society. The survey of students will help to find directions of scientific thought in the use of AI to increase the quality of higher educational services.

Conclusions. The aim of the article has been achieved.

1. These were 3 examples of the use of Artificial Intelligence in the market of higher educational services. These were 4 hypothetical options for the interaction of the consumer of educational services, the provider of educational services and Artificial Intelligence. It has been theoretically shown that in two variants (50%), AI technologies threaten the quality of higher educational services.

2. This article has high theoretical, practical, methodological and social significance. The obtained research results are important for students, university teachers and society.

3. In the study it was created and described the questionnaire to assess students' opinions on the use of Artificial Intelligence on the higher educational services market. Students' answers will help determine the degree of threat in a digital (quantitative) form. Thus, this is a given vector of practical implementation of theoretical and methodological results.

4. The author recommends university teachers and university authorities to suspend the fight against the illegal use of Artificial Intelligence by students until the results of the survey are received. Interviewing students and verifying statistical hypotheses will help save time and intellectual resources. Also, the survey will give a digital answer to what size do you have Artificial Intelligence threats for the quality of higher educational services.

Prospects for further research may be seen in the survey of students and obtaining new scientific knowledge about the threat of Artificial Intelligence for the quality of the higher educational services based on the verification of statistical hypotheses.

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ЧИ Є ШТУЧНИЙ ІНТЕЛЕКТ ЗАГРОЗОЮ ЯКОСТІ ПОСЛУГ ВИЩОЇ ОСВІТИ?

Валері Окуліч-Козарин, доктор соціальних наук, професор кафедри соціальних наук та інформатики Національного Луїського університету, Новий Сонч, Польща, e-mail : wokulicz-kozaryn@wsb-nlu.edu.pl

Стаття присвячена важливій сучасній проблемі – зростанню якості вищих освітніх послуг. Ця проблема завжди була актуальна сама собою. Як було показано, з 2017 року ситуація ускладнилася – на ринку вищих освітніх послуг з'явився новий гравець. Це – Штучний Інтелект. Стаття висвітлює ситуацію, що склалася на ринку вищих освітніх послуг за участю трьох гравців: споживача освітніх послуг (студентів), провайдера освітніх послуг (університетських викладачів) та Штучного Інтелекту.

Мета статті – знайти відповідь на дослідницьке питання: чи становить штучний інтелект загрозу якості послуг вищої освіти? Автор використовував надійні та економічно обґрунтовані методи дослідження. Це були такі методи, як дослідження наукових джерел; педагогічне спостереження та опис життєвих прикладів; моделювання та прогнозування, аналіз та синтез; проектування анкети для опитування студентів.

У процесі проектування анкети для вивчення думки студентів щодо використання Штучного Інтелекту для навчання автор використав можливості Штучного Інтелекту. Опитування студентів з верифікацією статистичних гіпотез дадуть практичну відповідь на дослідницьке питання: чи є штучний інтелект загрозою якості послуг вищої освіти?

Було проаналізовано наявність загроз три приклади використання штучного інтелекту у вищих освітніх послугах. Це було проаналізовано чотири гіпотетичні варіанти інтеракції трьох гравців на ринку вищих освітніх послуг: споживача освітніх послуг (студентів), провайдера освітніх послуг (університетських вчителів) та Штучного Інтелекту. Була отримана теоретична відповідь на дослідницьке питання: у двох варіантах із чотирьох (50 %) існує загроза якості вищих освітніх послуг.

Ключові слова: Штучний Інтелект, професійне навчання, освітні послуги, якість освітніх послуг, загрози якості освітніх послуг, споживач освітніх послуг, провайдер освітніх послуг.

Стаття надійшла до редакції / Received 19.03.2023

Прийнята до друку / Accepted 18.04.2023

Унікальність тексту 95 % (Unicheck ID1015209429)

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