УДК 378.147

ABOUT THE RESEARCH PROGRAM OF ARTIFICIAL INTELLIGENCE ON HIGHER EDUCATION SERVICE MARKET FOR 2022–2027

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Resume:
The article analyzes the intensity of publications on the topic "Artificial Intelligence and Higher Education". The trend line and the mathematical (regression) model of the intensity of publications were constructed. This was the first scientific fact obtained: an increase in the number of publications on the topic "Artificial Intelligence and Higher Education" from 2019 to 2022 was shown. This growth is almost 3 times. It was obtained the second scientific fact: a new player appeared on the higher education service's market. It was obtained the third scientific fact: nobody knows the exact answer to the question, will AI displace the provider on the higher educational services market? The author also described a Research Program of Artificial Intelligence on higher education service market for 2022-2027. This is the Research Program "Artificial Intelligence and Higher Education: advantages and threats of the use AI on the post-Soviet educational services market". It is a grandiose program in terms of the coverage of the territory, the number of respondents and its importance for civilization. Its financial and legal basis is based on two scientific projects. Its scientific basis is several monographs and above 20 articles in the Scopus and Web of Science databases published by the participants of the Research Program.

Key words:
Artificial Intelligence; higher education; higher education services; higher education services market; Research Program.

Анотація:
Окуліч-Козарин Валерій. Про програму досліджень штучного інтелекту на ринку послуг вищої освіти на 2022–2027 рр.
У статті проаналізовано інтенсивність публікацій за темою: «Штучний інтелект та вища освіта». Було створено лінію тренду та математичну (регресійну) модель інтенсивності публікацій. У результаті дослідження було продемонстровано збільшення кількості публікацій за темою «Штучний інтелект та вища освіта» майже втричі з 2019 до 2022 року. Також було висвітлено те, що на ринку послуг у сфері вищої освіти з'явився новий гравець – штучний інтелект. Було розглянуто проблемне питання стосовно того, що ніхто поки не готовий дати достеменно точної відповіді на питання: чи витіснить штучний інтелект провайдера на ринку послуг у сфері вищої освіти. Автором було описано Програму досліджень штучного інтелекту на ринку послуг вищої освіти на 2022–2027 рр., що має назву «Штучний інтелект та вища освіта: переваги й загрози використання ШІ на пострадянському ринку освітніх послуг». Це грандіозна програма з погляду охоплення території, кількості респондентів та її важливості для цивілізації.

Ключові слова:
Штучний інтелект; вища освіта; послуги вищої освіти; ринок послуг вищої освіти; програма досліджень.

Setting of the problem. In 1988, a very important article appeared (Wilson, Kuperman, Crawford, & Perez, 1988). The article was about the first stage in the development of a human factor tool for evaluating an artificial intelligence (AI) system. The study of ratings showed that attributes related to the educational aspects of AI received the lowest importance ratings (Wilson, Kuperman, Crawford, & Perez, 1988). After 30 years, the number of publications on the use of AI in higher education has increased significantly compared to the previous period. This study is based on the assumption that the intensity of publications on the use of AI in higher education correlates with the breadth of AI application on the market of higher education services. Thus, it is possible to record both the application of AI into the practice of higher education and the interest of researchers in this topic.

The author's first results of using AI for educational services were published in 1992. In 2022, the author returned to the study of AI.

This research is the third stage of the study of the quality of the higher educational services. The third stage relates the use AI for higher educational services.

The first stage of the study was carried out in 2016-2018. The purpose of the first stage of the study was to analyze the university offers and student needs at lectures on the market of higher educational services at universities in Eastern Europe (Okulicz-Kozaryn, 2018).

The leading hypothesis of the first stage of the study: the method of providing educational services at lectures corresponds to the needs and preferences of consumers of higher educational services.

The experimental base of the study consists of seventeen higher educational institutions from seven Eastern European countries. The number of officially recognized countries related to the educational services market in Eastern Europe is twenty-three. In the theory of experiment planning, there is the concept of fractional factorial experiment, which allows you to dramatically reduce the number of experiments. In our case, by analogy, it is possible to use ¼ replicas of the experiment plan (Okulicz-Kozaryn, 2018). This means that this empirical study should be carried out in at least 25% of countries. Thus, the carrying of empirical experiments in 7 countries is justified (Okulicz-Kozaryn, 2018).

More than 1200 respondents took part in the survey - thirty-three groups of students with maximum cultural and educational diversity. At that time my Colleagues and I used paper questionnaires. So, 1021 questionnaires were accepted for final processing.

With a high statistical significance level of 99,0%, an alternative hypothesis was adopted: the method of providing educational services at lectures does not correspond to the needs and preferences of

consumers of higher educational services, if random deviations are not taken into account (Okulicz-Kozaryn, 2018).

The second stage of the study was carried out in 2019-2022.

The purpose of the second stage of the study was to analyze the university offers and student needs in distance learning methods on the market of higher educational services at universities in Eastern Europe (Okulicz-Kozaryn, 2022).

In total, more than 2000 consumers of higher educational services were interviewed in seven Eastern European countries. At that time, my Colleagues and I started using electronic tools to survey consumers of higher educational services. These were services such as: Google forms, https://www.mentimeter.com, CloudA of National Louis University.

The leading hypothesis of the second stage of the study: the university offers in distance teaching meet the student needs in distance learning.

This hypothesis was tested both before and during the COVID-19 epidemic.

With a high statistical significance level of 99,0%, an alternative hypothesis was adopted: the university offers in distance teaching do not meet the student needs in distance learning methods, if random deviations are not taken into account (Okulicz-Kozaryn, 2022; Okulich-Kazarin, Losiyevska, Fesenko, Zhurba, & Bondarchuk, 2022; Zhurba, Bokhonkova, Marchenko, Buhaiova, & Zhurba, 2021).

Analysis of recent achievements and publications. The term artificial intelligence (AI) was coined in 1956, but today AI has become more popular due to increased data volumes, improved algorithms and improvements in computing power and memory. This refers to software technologies that make a robot or computer behave like a human (Gaia Sartori, & Kristel Strazzer, 2020).

In the 70s, the belief in the possibility of artificial intelligence was the belief that everything that is necessary for human intelligence can be formalized. Initially, AI failed to meet early expectations regarding pattern recognition and problem solving (Hubert, 1974).

At the third stage of the study my colleagues and I have started to explore a new aspect of educational services in 2022.

In 2022 the author continued to explore the use of Artificial Intelligence (AI) to improve the quality of higher educational services. And my Colleagues and I have noticed that a new player has appeared in the higher educational service market. This player is Artificial Intelligence. This fact complicates the management of educational services.

So, the purpose of the third stage of the study is to increase the quality of higher education services, taking into account the advantages and threats of AI.

The problem of the use AI has been studied in many ways by many scientists. In the search engine "SAGE Journals. Search results" it was found 11,858 publications on the named topic and keywords on the date of December 10, 2022. These publications cover pedagogical, philosophical, psychological, legal, sociological, economic, financial, ethical aspects of the introduction of AI in higher education (Shouxuan Yan, & Yun Yang, 2021; Pence, 2019). In some publications, the authors explore issues related to security (Pontius, 1993).

Certainly, the specified search engine does not cover all publications on a given topic. At the same time, the information obtained allows you to draw a general picture.

Formulation of the objectives of the article. The purpose of the article is to analyze the intensity of publications on the named topic and describe the Research Program of Artificial Intelligence on higher education service market for the next 5 years.

Presentation of the main research material. The author has divided the main research materials into three parts.

In the first part of the article, the author showed the results of a statistical study of the number of publications on this topic over the past 5 years. It was 2018-2022.

Total in the search engine "SAGE Journals. Search results" it was found 11,858 publications on the named topic and keywords on the date of December 10, 2022. The author accepted 1.0% of the number of all publications to analyze the intensity of publication on the named topic. In total, it was 120 of the closest publications on the named topic and keywords. The author took as a basis the assumption that all publications are distributed evenly.

Figure 1. is a pie chart that shows the intensity of publication on the named topic. The number of 120 publications is related to 100 percent.

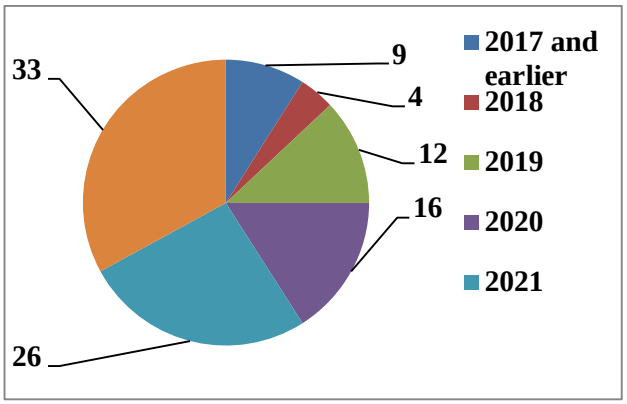

Figure 1. The share of publications (%) on the topic "Artificial Intelligence and Higher Education" in different time periods.

That is, Figure 1 shows the shares of publications in different time periods. Figure 1 shows that the total number of publications since 1988 till 2017 were about 2 times more than in 2018. And there were published more publications in 2019 than since 1988 till 2017.

In 2020 the same number of publications were published as in the previous two years. It was 2018 and 2019 (Figure 1).

Figure 1 shows that, the largest number of publications is in 2022. This is 33% of the total number of publications.

In other words, Figure 1 shows a steady increase in the number of publications on the topic "Artificial Intelligence and Higher Education" by almost 3 times since 2019 till 2022 and about 8 times since 2018 till 2022. This means that we have a fact: AI has entered the market of higher education services.

Thus, Figure 1 shows the overall qualitative picture. Unfortunately, it shows an overall increase in the number of publications.

However, Figure 1 does not show a trend line and does not allow you to represent the number of publications in a digital (quantitative) form.

Figure 2 shows the change in the number of publications over time. It also shows a trend line and a mathematical (regression) model on the topic "Artificial Intelligence and higher education" over the past 5 years.

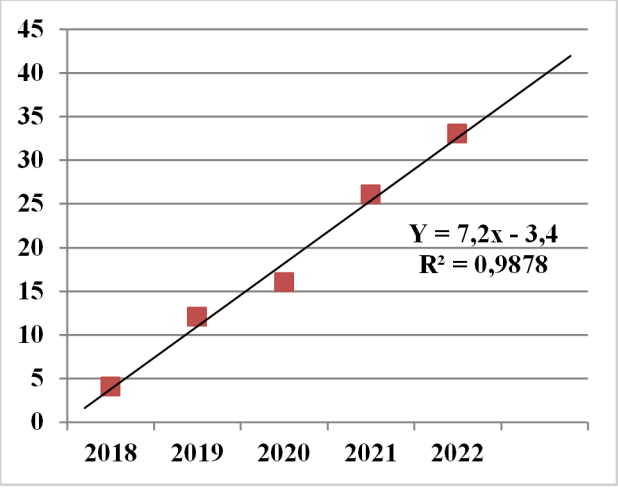

Figure 2. Number of publications (%), trend line and mathematical (regression) model on the topic "Artificial Intelligence and Higher Education" since 2018 until recently.

Figure 2 shows the trend line and mathematical (regression) model. The trend line is a straight line with a very high correlation coefficient ($R^2 = 0.9878$). Mathematical (regression) model allows you to estimate the increase in the number of publications over any period of time. Also, this model allows you to make a forecast for the next 5 years ahead. This model also shows that the real growth in the number of publications the topic "Artificial Intelligence and Higher Education" began in 2017. The trend line shows that the number of publications on the topic "Artificial Intelligence and Higher Education" was negligible until 2017 (Figure 2).

In the second part of the article, the author gave a scheme of the process of providing higher educational services. On Figure 3 (left) this is a consumer of higher education services (student) and a provider of higher education services (university). Recently, an AI appeared in this scheme (Figure 3, right) since 2017 (Figure 1, Figure 2).

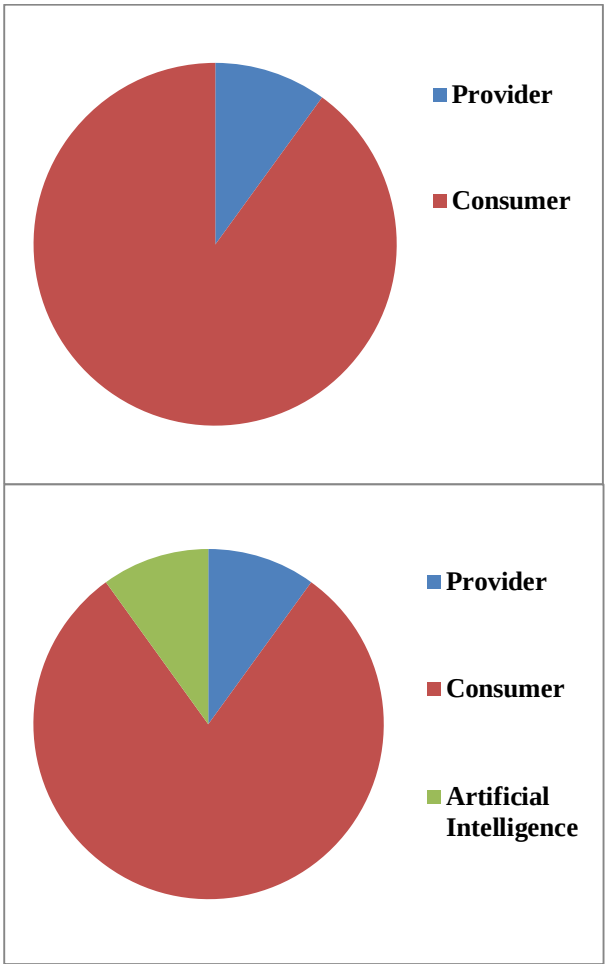

Figure 3. Consumer, provider and Artificial Intelligence on the higher educational services market.

Figure 3 is a qualitative figure. It does not display quantitative data. Since no one knows how big is an AI role in higher education services today and in the near future (Figure 3, right).

However, if a new player has appeared on the balanced higher educational services market (Figure 3, left), he occupies a part of this market (Figure 3, right). It can be assumed that the share of consumers in this market cannot be reduced. Does this mean that AI will displace the provider? We don't know the exact answer to this question. However, we should recognize the fact of the appearance of a new player in the market of higher education services.

In the third part of the article, the author describes the Research Program of Artificial Intelligence on higher education service market for the next 5 years. This is the Research Program "Artificial Intelligence and Higher Education: advantages and threats of cooperation in the post-Soviet educational services market".

Objective: to increase the quality of higher education services, taking into account the advantages and threats of Artificial Intelligence (AI).

Type of research: multidisciplinary (pedagogy, philosophy, psychology, law, sociology, economics, finance, security, ethics, etc.).

Research area: post-Soviet countries.

Planned number of respondents: 15000 respondents or more.

Object of research: AI in the market of higher education services.

Subject of research: the impact of AI on the quality of the higher educational services.

Legal and financial grounds:

1. Project "Quality of Educational Services and Values of European culture" (Sobornost ZSL 20211204/1), Scientific research "Analysis and Development of Recommendations for Teachers of Ukrainian Universities to Improve the Quality of Educational Services" at National Louis University (Nowy Sącz, Poland), Service Agreement No. EU-1/21 since October 15, 2021 till December 31, 2025.

2. Project "02. Analysis of the effectiveness of educational processes on the basis of competencies and opinions of the participants of the educational process: innovations in the management of educational systems and processes" at Pedagogical University of Cracow since January 01, 2018 till April 30, 2019.

Thus, the Research Program is based on the results of two research projects. The scientific and publication basis of the Research Program consists of several scientific monographs and more than 20 articles indexed in the Scopus and Web of Science databases published by the participants of the Research Program. This is very important, that the Research Program is a good basis for new EU's grants.

Research plan of the Research Program "Artificial Intelligence and Higher Education: advantages and threats of the use in the post-Soviet educational services market" is in Table 1.

Table 1. Six steps to realize the Research Program "Artificial Intelligence and Higher Education: advantages and threats of the use in the post-Soviet educational services market" since 2022 till 2027.

2022 (base year of the research)	
- Study of publication activity on the use of AI in higher education, creation and analysis of a trend line.	done
2023 (first year of the research)	
- Basic theoretical research (definitions, role and place of AI in educational services). - Preparation of a questionnaire for the survey of students and university teachers. - Empirical assessment of the degree of use of AI by bachelor students, master students, and university teachers of non-information and non-telecommunication disciplines. - Empirical assessment of AI threats to higher education in the subjective opinions of students and university teachers of non-information and non-telecommunication disciplines. - Statistical processing of questionnaires of students and university teachers.	
2024 (second year of the research)	
- Continuation of theoretical research taking into account the empirical results of the first year of research (clarification of definitions, clarification of the role and place of AI in higher educational services). - Empirical assessment of the degree of use of AI by bachelor students, master students, teachers of information and telecommunication disciplines. - Empirical assessment of AI threats to higher education in the subjective opinions of students and teachers of information and telecommunication disciplines. - Statistical processing of questionnaires of students and university teachers. - Preparation of recommendations on stopping the threats of using AI in higher education.	
2025 (third year of the research):	
- Multidisciplinary analysis and theoretical evaluation of philosophical, psychological, ethical, financial, technical and other aspects of the use of AI in higher education services. - Theoretical and empirical assessment of AI threats to higher education services. - Statistical processing of questionnaires of students and university teachers. - Continuation of the preparation of recommendations on the elimination of threats to the use of AI in higher education services.	
2026 (fourth year of the research):	
- Theoretical and empirical assessment of the advantages of using AI in higher education. - Statistical processing of questionnaires of students and university teachers.	

- Preparation of recommendations to expand the benefits of using AI in higher education. - Additional study according to current challenges.	
2027 (fifth year of the research):	
- Designing of the theoretical foundations of higher education didactics based on the use of AI in educational services. - Preparation of methodological recommendations and practical measures for the use of AI in the provision of educational services of higher education. - Adjustment of the plan for further research based on the results obtained.	

Table 1 shows that the Research Program "Artificial Intelligence and Higher Education: advantages and threats of the use AI on the post-Soviet educational services market" is a logical continuation of the previous research of the Eastern European Scientific Group.

This Research Program is an international multidisciplinary Program since 2022 till 2027. That is, the Research Program has already been released since 2022 (Table 1).

And the Research Program is a grandiose and very useful program for 2023-2027. This Research Program is grandiose in terms of the coverage of the territory, the planned number of respondents and its importance for civilization.

Conclusions. The purpose of the article has been achieved. The author has analyzed the intensity of publications on this topic. The trend line and the mathematical (regression) model were constructed.

The author has described the Research Program of Artificial Intelligence on higher education service market for 2022-2027. The Research Program is «Artificial Intelligence and Higher Education: advantages and threats of the use AI on the post-Soviet educational services market». The Research Program is grandiose in terms of the coverage of the territory, the planned number of respondents and its importance for civilization.

This is the first scientific fact. This is a steady increase in the number of publications on the topic "Artificial Intelligence and Higher Education" by almost 3 times from 2019 to 2022.

This is the second scientific fact. A new player has appeared in the market of higher education services.

This is the third scientific fact. We don't know the exact answer to the question: will AI displace the provider on the higher educational services market?

Therefore, the purpose of further research is to implement the Research Program «Artificial Intelligence and Higher Education: advantages and threats of the use AI on the post-Soviet educational services market».

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doi: 10.33842/22195203-2023-29-19-24

Received at the editorial office 12.11.2022.
Accepted for publishing 27.11.2022.

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doi: 10.33842/22195203-2023-29-19-24

Матеріал надійшов до редакції 12.11.2022 р.
Прийнято до друку 27.11.2022 р.