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Artificial Intelligence as a Factor Revolutionizing Higher Education



Authors' Contribution:
A – Study design;
B – Data collection;
C – Statistical analysis;
D – Data interpretation;
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Abstract

The use of artificial intelligence and various chatbots based on it is becoming part of everyday higher education practice. The aim of the study: to explore practices and identify trends in the use of artificial intelligence-based chatbots by higher education stakeholders.

The survey was conducted between January and April 2024. The total number of respondents from 57 countries was 788, of whom 363 were students and 425 were university faculty. The probability sampling method was applied. Respondents were interviewed online. The questionnaire is available on the official website of the Scientific Research Institute KRPOCH using Google Forms, as well as on social networks Facebook, LinkedIn, etc. for potential participants. In addition, a selective individual online interview was conducted with respondents. Cronbach's alpha confirmed adequate internal consistency ($\alpha=0.837$).

The role of artificial intelligence-based chatbots in higher education practice was considered. The use of chatbots among higher education stakeholders (students and faculty) was studied. A model of stakeholder behaviour was developed. This model describes two ways of solving problems: with and without the use of artificial intelligence. Trends in the use of chatbots in higher education were identified: students were 26.9% more likely than faculty to use artificial intelligence-based chatbots to prepare for classes or complete assignments at their college/university; almost all students (68.0% of 68.3% who use chatbots) edited the results returned by generative chatbots at their request; students were 30.1% more likely than faculty to edit these results.

The new technologies of generative artificial intelligence have been the factors that have revolutionised the industry of higher education. A new “Human-AI” system has emerged that is fundamentally changing the rules for training young professionals. The study emphasizes that higher education stakeholders using chatbots should do so correctly, consider the possibilities and limitations of using this toolkit, and recognize their responsibility for the outcomes and consequences of their use.

education, artificial intelligence, chatbots, Human-AI system, interaction, responsibility, stakeholder

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Introduction

Society has entered an era of digitalisation. This has opened up new perspectives for the study and use of artificial intelligence (Pypenko, 2019). The higher education industry is one of the first sectors of human endeavour to embark on digital transformation (Shenkoya & Kim, 2023). The number of studies and publications on the use of artificial intelligence (AI) in higher education has increased two to three times in the last five years compared to previous years (Bearman et al., 2023; Chu et al., 2022; Crompton & Burke, 2023). The advent of chatbots based on artificial intelligence (AI chatbots) and specialised in text (Large Language Models) has been a catalyst and a major factor in revolutionising higher education. These changes are in progress at this moment. The changes affect all elements of the higher education system and all stakeholders involved in the process. Today, we are seeing a boom in the use of various AI-based chatbots by faculty and students in the educational process.

As a result, many new questions arise about the legitimacy of using AI and adhering to ethical standards when using AI chatbots in education and science (Melnyk & Pypenko, 2023). Therefore, there is an obvious need to study the influence and role of AI in the research and teaching activities of professors and the learning activities of university students.

The aim of the study. To explore practices and identify trends in the use of artificial intelligence-based chatbots by stakeholders in higher education.

Materials and Methods

The study was conducted among 363 students (175 males and 188 females) and 425 university faculty (198 males and 227 females) from 57 countries between January and April 2024. The probability sampling method (randomly generated) was used to survey faculty working in hybrid modes in higher education. A similar method was used to survey students who were studying synchronous contact and distance learning or asynchronous distance learning. The survey was voluntary. Participation was anonymous. Respondents were interviewed online.

The questionnaire was available on the official website of the Scientific Research Institute KRPOCH using Google Forms

(https://docs.google.com/forms/d/e/1FAIpQLSeu0HZW1t715guMH7M_FcTDizHxnpU-OvPMU1_ICfPF_K9y6g/viewform). The questionnaire was also made available to potential participants on social networking sites such as Facebook, LinkedIn, etc. A selective individualised online interview was also conducted with survey participants, when it was necessary to clarify their answers and/or determine the specifics of their use of AI chatbots.

Statistical analyses were performed using SPSS 28.0.1 software. Descriptive statistics using frequencies, means and standard deviations were used to analyze the data collected. Cronbach's alpha was used to assess internal consistency. Cronbach's alpha was 0.837. This meets internal consistency requirements ($\alpha > 0.7$).

Results

The questionnaire developed consisted of six questions. It was used to gather information about the possibilities of using AI chatbots in higher education. The questionnaire consisted of an instruction sheet explaining the purpose and conditions of the study and six questions, of which three questions characterised the respondent (gender, status, country) and three questions related to the purpose of the study.

To explore how stakeholders are using AI chatbots in higher education, the following general questions apply:

A. Does your college/university use hybrid learning (face-to-face / distance learning)?

B. Do you use artificial intelligence-based chatbots to prepare for classes or complete assignments at your college/university?

C. Do you edit the results returned by generative chatbots at your request?

The questions involved the choice of one of the answer options "yes" or "no".

The key findings of the study on the use of artificial intelligence-based chatbots by higher education stakeholders are summarized in Tables 1–3.

Table 1

Comparative Characteristics of the Use of Hybrid (Face-to-Face/Distance) Learning by Higher Education Stakeholders

Higher education stakeholders	Answer to question A				Total	
	Positive		Negative		people	%
	people	%	people	%		
Students	315	86.8	48	13.2	363	100.0
Male	141	38.8	34	9.4	175	48.2
Female	174	47.9	14	3.9	188	51.8
Faculty	353	83.1	72	16.9	425	100.0
Male	178	41.9	20	4.7	198	46.6
Female	175	41.2	52	12.2	227	53.4
Total	668	84.8	120	15.2	788	100.0
Male	319	40.5	54	6.9	373	47.3
Female	349	44.3	66	8.4	415	52.7



Table 2

Comparative Characteristics of Higher Education Stakeholders' Use of Artificial Intelligence-Based Chatbots to Prepare for Classes or Complete Assignments at Their College/University

Higher education stakeholders	Answer to question B				Total	
	Positive		Negative		people	%
	people	%	people	%		
Students	248	68.3	115	31.7	363	100.0
Male	121	33.3	54	14.9	175	48.2
Female	127	35.0	61	16.8	188	51.8
Faculty	176	41.4	249	58.6	425	100.0
Male	81	19.1	117	27.5	198	46.6
Female	95	22.4	132	31.1	227	53.4
Total	424	53.8	364	46.2	788	100.0
Male	202	25.6	171	21.7	373	47.3
Female	222	28.2	193	24.5	415	52.7

Table 3

Comparative Characteristics of the Processing of the Results Returned by the Generative Chatbot at the Request of Higher Education Stakeholders

Higher education stakeholders	Answer to question C				Total	
	Positive		Negative		people	%
	people	%	people	%		
Students	247	68.0	116	32.0	363	100.0
Male	124	34.2	51	14.0	175	48.2
Female	123	33.9	65	17.9	188	51.8
Faculty	161	37.9	264	62.1	425	100.0
Male	88	20.7	110	25.9	198	46.6
Female	73	17.2	154	36.2	227	53.4
Total	408	51.8	380	48.2	788	100.0
Male	212	26.9	161	20.4	373	47.3
Female	196	24.9	219	27.8	415	52.7

The results showed that 84.8% (668 people) of the stakeholders have the possibility of hybrid (face-to-face/distance) learning in their college/university, including 40.5% (319 people) males and 44.3% (349 people) females. Only 15.2% (120 people), of whom 6.9% (54 people) were male and 8.4% (66 people) were female, do not use hybrid learning.

53.8% (424 people), including 25.6% (202 people) males and 28.2% (222 people) females, use artificial intelligence-based chatbots to prepare for classes or complete assignments at their college/university.

A negative answer to question B was given by 46.2% (364 people) of the stakeholders, of whom 21.7% (171 people) were male and 24.5% (193 people) were female. Overall, the results returned by generative chatbots are edited by 51.8% (408 people) of stakeholders, including 26.9% (212 people) men and 24.9% (196 people) women. Slightly less than half of the stakeholders (48.2% or 380 people) do not edit the results, of whom 20.4% (161 people) were male and 27.8% (219 people) were female.

The comparative characteristics of the use of artificial intelligence-based chatbots by stakeholders of higher education (students and university faculty) at their college/university are shown in Figures 1–3.

The comparative characteristics of stakeholders showed that 86.8% (315 people) of students, including 38.8% (141 people) males and 47.9% (174 people) females, and 83.1% (353 people) of faculty, including 41.9% (178 people) males and 41.2% (175 people) females, use hybrid (face-to-face/distance) learning in their college/university. Only 13.2% (48 people) of students, of whom 9.4% (34 people) were male and 3.9% (14 people) were female, and 16.9% (72 people) of faculty, of whom 4.7% (20 people) were male and 12.2% (52 people) were female, do not use hybrid learning.

The comparative characteristics of higher education stakeholders who use of artificial intelligence-based chatbots to prepare for classes or complete assignments at their college/university showed that 68.3% (248 people) of students, of whom 33.3% (121 people) were male and 35.0% (127 people) were female, use of AI-based chatbots. Consequently, 31.7% (115 people) of the students do not, including 14.9% (54 people) males and 16.8% (61 people) females.

A different trend is observed among faculty. Only 41.4% (176 faculty), including 19.1% (81 people) males and 22.4% (95 people) females, use artificial intelligence-based chatbots to prepare for classes or complete assignments at their college/university.



Figure 1

Use of Hybrid (Face-to-Face/Distance) Learning by Higher Education Stakeholders (Students and Faculty) at Their College/University

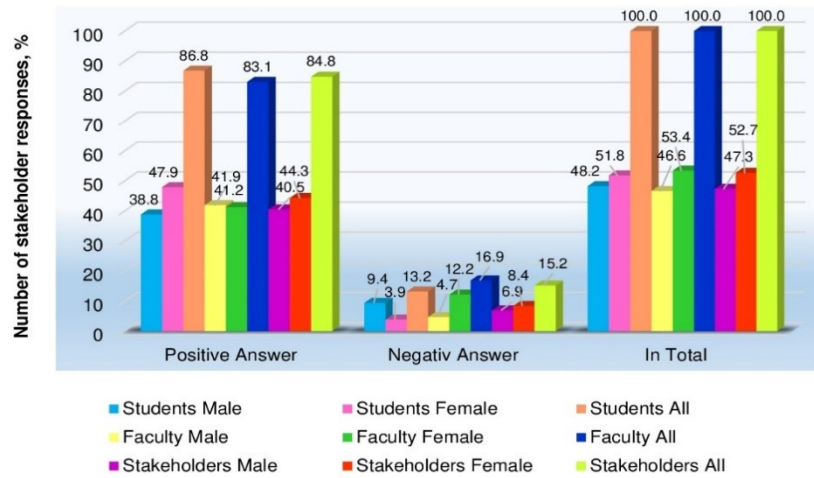


Figure 2

Use of Artificial Intelligence-Based Chatbots by Higher Education Stakeholders (Students and Faculty) to Prepare for Classes or Complete Assignments at Their College/University

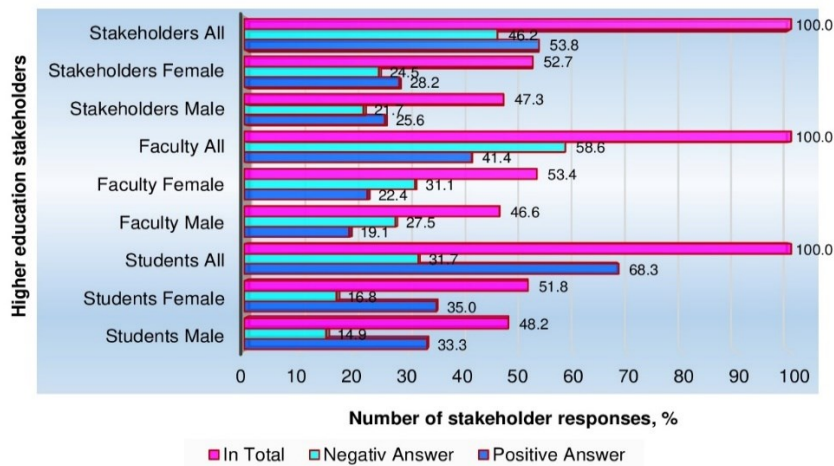
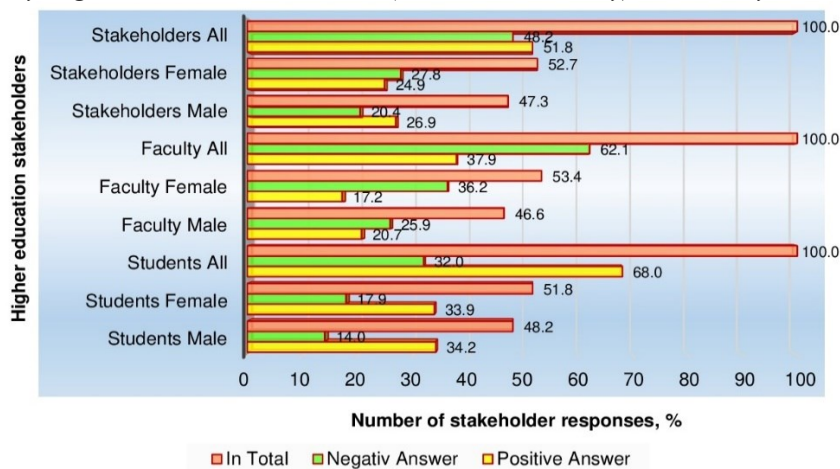


Figure 3

Processing of Results by Higher Education Stakeholders (Students and Faculty) Returned by Generative Chatbots



In other words, more than half of the faculty (58.6% or 249 people, of whom 27.5% or 117 people were male and 31.1% or 132 people were female) do not use it. The comparative characteristics of higher education stakeholders who process of the results returned by generative chatbots at their request showed that 68.0%

(247 people) of students, of whom 34.2% (124 people) were male and 33.9% (123 people) were female, edit the results. Accordingly, 32.0% (116 people) of the students do not edit, including 14.0% (51 people) males and 17.9% (65 people) females.



The trend is different for faculty. Only 37.9% (161 faculty), including 20.7% (88 people) males and 17.2% (73 people) females, edit of the results returned by generative chatbots at their request. That is, more than 60.0% of the faculty (62.1% or 264 people, of whom

25.9% or 110 people were male and 36.2% or 154 people were female) do not edit.

The comparative characteristics of the respondents (higher education stakeholders), grouped by country, are presented in Table 4.

Table 4
Comparative Characteristics of Respondents Grouped by Country

Country	Respondents, people		Respondents, %		Respondents, people		Respondents, %		Respondents, total	
	Students	Faculty	Students	Faculty	Male	Female	Male	Female	People	%
US	21	24	2.7	3.0	31	14	3.9	1.8	45	5.7
India	23	21	2.9	2.7	21	23	2.7	2.9	44	5.6
Ukraine	36	3	4.6	0.4	4	35	0.6	4.4	39	4.9
Indonesia	21	18	2.7	2.3	25	14	3.2	1.8	39	4.9
Singapore	16	19	2.0	2.4	16	19	2.0	2.4	35	4.4
China	18	16	2.3	2.0	15	19	1.9	2.4	34	4.3
UK	18	15	2.3	1.9	16	17	2.0	2.2	33	4.2
Canada	17	14	2.2	1.8	12	19	1.5	2.4	31	3.9
Japan	16	14	2.0	1.8	14	16	1.8	2.0	30	3.8
Australia	15	13	1.9	1.6	11	17	1.4	2.2	28	3.6
Portugal	11	16	1.4	2.0	10	17	1.3	2.2	27	3.4
Germany	8	18	1.0	2.3	12	14	1.6	1.7	26	3.3
France	11	15	1.4	1.9	12	14	1.6	1.7	26	3.3
Spain	10	14	1.3	1.8	11	13	1.5	1.6	24	3.0
Italy	10	11	1.3	1.4	9	12	1.1	1.5	21	2.7
Brazil	9	12	1.1	1.5	10	11	1.3	1.4	21	2.7
Philippines	12	8	1.5	1.0	8	12	1.0	1.5	20	2.5
Austria	10	8	1.3	1.0	10	8	1.3	1.0	18	2.3
Denmark	8	5	1.0	0.6	4	9	0.5	1.1	13	1.6
Ireland	2	10	0.3	1.3	6	6	0.7	0.8	12	1.5
Israel	9	3	1.1	0.4	5	7	0.6	0.9	12	1.5
Sweden	5	6	0.6	0.8	6	5	0.7	0.7	11	1.4
South Africa	2	8	0.3	1.0	5	5	0.7	0.6	10	1.3
South Korea	3	7	0.4	0.9	4	6	0.5	0.8	10	1.3
New Zealand	6	5	0.8	0.6	6	5	0.7	0.7	11	1.4
UAE	2	7	0.3	0.9	5	4	0.6	0.5	9	1.1
Finland	1	8	0.1	1.0	5	4	0.6	0.5	9	1.1
Czech Republic	3	5	0.4	0.6	3	5	0.4	0.6	8	1.0
Argentina	1	6	0.1	0.8	4	3	0.5	0.4	7	0.9
Poland	3	4	0.4	0.5	4	3	0.5	0.4	7	0.9
Estonia	1	6	0.1	0.8	3	4	0.4	0.5	7	0.9
Switzerland	2	5	0.3	0.6	4	3	0.5	0.4	7	0.9
Lithuania	1	5	0.1	0.6	2	4	0.3	0.5	6	0.8
Belgium	0	6	0.0	0.8	3	3	0.4	0.4	6	0.8
Mexico	0	6	0.0	0.8	2	4	0.3	0.5	6	0.8
Saudi Arabia	2	4	0.3	0.5	4	2	0.5	0.3	6	0.8
Nigeria	1	5	0.1	0.6	5	1	0.6	0.1	6	0.8
Malaysia	2	4	0.3	0.5	3	3	0.4	0.4	6	0.8
Romania	0	6	0.0	0.8	2	4	0.3	0.5	6	0.8
Greece	1	4	0.1	0.5	1	4	0.1	0.5	5	0.6
Iceland	4	1	0.5	0.1	3	2	0.3	0.3	5	0.6
Tunisia	2	3	0.3	0.4	3	2	0.3	0.3	5	0.6
Latvia	2	3	0.3	0.4	3	2	0.3	0.3	5	0.6
Norway	1	4	0.1	0.5	3	2	0.3	0.3	5	0.6
Slovakia	1	4	0.1	0.5	3	2	0.3	0.3	5	0.6
Turkey	0	5	0.0	0.6	3	2	0.3	0.3	5	0.6
Netherlands	3	2	0.4	0.3	3	2	0.3	0.3	5	0.6
Thailand	2	3	0.3	0.4	3	2	0.3	0.3	5	0.6
Taiwan	1	4	0.1	0.5	3	2	0.3	0.3	5	0.6
Oman	3	1	0.4	0.1	3	1	0.4	0.1	4	0.5
Algeria	0	4	0.0	0.5	3	1	0.4	0.1	4	0.5
Bahrain	2	1	0.3	0.1	3	0	0.4	0.0	3	0.4
Colombia	1	2	0.1	0.3	2	1	0.2	0.2	3	0.4
Benin	2	0	0.3	0.0	2	0	0.3	0.0	2	0.3
Iraq	0	2	0.0	0.3	2	0	0.3	0.0	2	0.3
Kenya	1	1	0.1	0.1	1	1	0.1	0.1	2	0.3
Peru	1	1	0.1	0.1	1	1	0.1	0.1	2	0.3
Total	363	425	46.1	53.9	373	415	47.3	52.7	788	100.0



Respondents from the following countries have the highest representation:

- US (5.7%, including 2.7% students and 3.0% faculty, of whom 3.9% were male and 1.8% were female);
- India (5.6%, including 2.9% students and 2.7% faculty, of whom 2.7% were male and 2.9% were female);
- Ukraine (4.9%, including 4.6% students and 0.4% faculty, of whom 0.6% were male and 4.4% were female);
- Indonesia (4.9%, including 2.7% students and 2.3% faculty, of whom 3.2% were male and 1.8% were female);
- Singapore (4.4%, including 2.0% students and 2.4% faculty, of whom 2.0% were male and 2.4% were female);
- China (4.3%, including 2.3% students and 2.0% faculty, of whom 1.9% were male and 2.4% were female);
- UK (4.2%, including 2.3% students and 1.9% faculty, of whom 2.0% were male and 2.2% were female).

Thus, the survey conducted among 363 university students and 425 university faculty from 57 countries allowed to obtain quantitative and qualitative characteristics of the use of AI chatbots in higher education. Importantly, students are 26.9% more likely than faculty to use AI-based chatbots to prepare for classes or complete assignments at their college/university. At the same time, almost all students (68.0% of 68.3% who use AI-based chatbots) edit the results returned by generative chatbots at their request. In addition, students are 30.1% more likely to edit these results than faculty.

Discussion

As AI develops in society and AI chatbots are used in higher education, this area is becoming increasingly important for research. Experts predict that the use of artificial intelligence in education will grow by 43.0% between 2018 and 2022 (Educause, 2018). But already in the 2019 Horizon Report for higher education (Educause, 2019), predictions about teaching and learning with AI applications have become even more optimistic. As practice has shown, they were fully justified.

In the first two months of OpenAI's ChatGPT, more than 100 million people became its active users. According to Reuters (Hu, 2023), the analysts note that in the last 20 years in the Internet space, it is hard to remember a faster growth rate for consumer Internet applications.

At first glance, the prospects look promising for students and faculty who have already begun to use AI-based tools. There is a growing consensus among researchers about the revolutionary impact of AI on learning and teaching in higher education (Alqahtani et al., 2023; O'Dea & O'Dea, 2023; Rahiman & Kodikal, 2024).

Because revolutionary impact can affect the way people live, as well as education, health, the economy and other areas of society, we limited our study to the higher education sector. However, this restriction is conditional, as these areas are closely intertwined in

higher education and the AI phenomenon is of interdisciplinary interest to the scientific community. AI chatbots are a tool used in a variety of interdisciplinary research and subject areas, including education (Doroudi, 2023; Shrivastava, 2023), psychological research in education (Bonneton et al., 2024; Melnyk, 2023), and medical education (Civaner et al., 2022; Masters, 2019), among others.

The most pressing issue in research into the revolutionary impact of AI on learning and teaching in higher education has been the following question: Is there compelling evidence that AI can have a positive pedagogical impact on students and be a reliable tool in the teaching and research process?

O'Dea and O'Dea (2023) argue that there is as yet no reliable evidence of how the use of AI technologies and applications has helped students improve their learning and/or helped faculty make effective pedagogical changes.

There is also an opposing point of view. A group of researchers claim that the introduction of AI has led to the development of robust assessment methods and increased teacher engagement (Rahiman & Kodikal, 2024); AI can shape future education and research practices, leading to better outcomes (Alqahtani et al., 2023), and radically transform and improve the way learning and teaching takes place in higher education institutions (Mishra, 2019).

Researchers on the digital transformation of the higher education sector take a similar view. These academics argue that digital transformation will lead to the development of sustainable curricula, the digitisation of higher education, increased innovation and improved student outcomes (Melnyk & Pypenko, 2021; Shenkoya & Kim, 2023).

In recent years, a growing number of researchers have argued that the implementation of AI is the most optimistic solution for improving education (Chedrawi & Howayeck, 2019). It suggests ways in which universities can change their role to respond quickly and effectively to emerging issues.

These may include new courses, but also organisational structures and new pedagogical practices (Moscardini et al., 2020).

The COVID-19 pandemic has accelerated the adoption of online technologies in higher education (Bartolic et al., 2022; Pypenko, et al., 2020) and the associated opportunities for AI-mediated student-teacher interaction (Rof et al., 2022).

Some researchers believe that the widespread availability of online learning platforms at universities has made it possible to study courses and training programmes to obtain degrees entirely online (Dieguez et al., 2021).

It is therefore possible that the use of online learning platforms is one of the reasons for the active development and application of AI in higher education. Therefore, one of our research questions is to investigate how the use of hybrid learning (face-to-face/distance learning) in higher education has influenced the use of AI tools among stakeholders.

The results show that there is a positive correlation between hybrid learning and the use of AI chatbots among students and faculty.

The results of our study, and the willingness of students to use AI chatbots in their education, are consistent with research on trends in the potential application of AI-based robots in higher education. Research shows that students are ready to use them in their education (AlGerafi et al., 2023). This, in turn, is a signal to university administrators. They should pay attention to the social demands of today's youth.

A key benefit of using AI in higher education is its ability to drive efficiency, personalisation and optimisation of administrative processes (Al Husseiny, 2023).

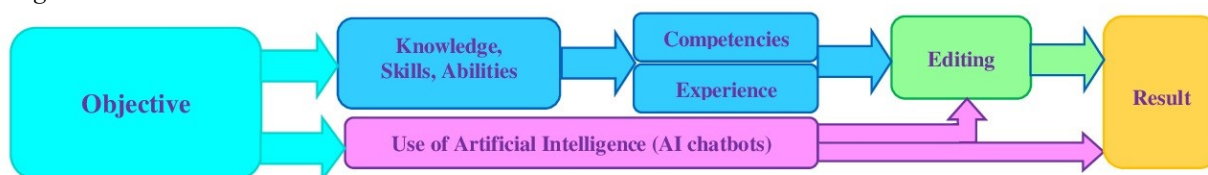
Examining global trends in the use of AI and their implications for changing educational paradigms highlights the role of collaboration and partnership in fostering innovation that, by setting new quality standards, stimulates the evolution of higher education (Aithal & Maiya, 2023).

With the advent of AI, the modern world has begun to change rapidly. And it is highly likely that the new Human-AI system will radically change the rules of student education in universities (Melnik & Pypenko, 2023).

In our view, the main problem with using AI in learning and teaching in higher education is getting the result without any human effort. We have presented a model of stakeholder behaviour in Figure 4.

Figure 4

A Model of Stakeholder Behaviour Describing two Options for Problem Solving: With and Without the Use of Artificial Intelligence



The model developed shows that stakeholders can use the following options to achieve their objectives.

The first option involves personal effort on the part of the stakeholder, using all available knowledge, skills, competencies and experience to achieve a result.

The second option involves the use of AI to achieve a result without any personal effort on the part of the stakeholder.

Interviewing students in the study revealed that they are actively using the help of AI chatbots in their studies, because it is personalised and delivers results in the shortest possible time. As a result, students are increasingly using AI chatbots to complete academic tasks. These activities increase the risk of students dropping out or experiencing academic difficulties.

In our view, AI tools can be useful for analysing information, searching and framing literature, and even to some extent for generating ideas.

However, rewriting (copying) the text generated by AI chatbots is not sufficient to fulfil the curriculum and is against ethical principles. In addition, search engines and plagiarism detection systems may consider such text to be duplicate content. This can have negative consequences for higher education stakeholders.

As we can see from the results of our survey, one of the most common ways to avoid duplicating or borrowing other people's work, and to make the result more original, is to edit the text generated by the AI. This tendency is more pronounced among students (68.0%) and less pronounced among faculty (37.9%).

It is possible that the use of AI chatbots by students and faculty, followed by editing and creative reinterpretation of the results, could be an intermediate, optimal way for them to interact with AI.

It should be noted that at the current stage of social and technological development, the issue of Human-AI

interaction remains unresolved. It still requires the development, ratification and implementation of laws governing the norms of interaction and relationships between humans and AI (Pypenko, 2023).

We believe that it is premature to declare a predominantly positive role for AI in higher education, given the current stage of AI development, the extent of its prevalence in higher education, and the lack of research on the subject. What is clear, however, is the revolutionary impact of AI on higher education.

Our research (questionnaires and interviews) showed that AI implementations at the institutional level were more likely to be initiated and implemented by students and faculty than by university administrators. Possible reasons for this are the need and the lack of readiness of administrations to upgrade the existing technological infrastructure of universities, and to introduce specialised courses for students and to organise professional development courses for faculty in the field of AI.

Conclusions

New generative artificial intelligence technologies are rapidly gaining popularity and have already become an integral part of the higher education industry. The new Human-AI system is fundamentally changing the rules of student education at universities.

AI tools can be useful for information analysis, literature searches and framing, and even to some extent for idea generation. However, rewriting text generated by AI chatbots may not be enough to produce high-quality original work. It is also in conflict with the ethical principles of scientific research. In addition, such text may be considered as duplicate content by search engines and plagiarism detection systems.

It is therefore appropriate not only to edit the text generated by AI chatbots (which is often limited to



faculty and students), but also to add value to the text in the form of information or an idea that should be developed from one's own world view to create something new and original.

Higher education stakeholders should be made aware that AI chatbots are just a tool that needs to be used properly, taking into account their capabilities and limitations. It is especially important to send a message to higher education stakeholders that when they use AI chatbots in their work, they are responsible for the outcomes and consequences of their use.

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Ethical Approval

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee. Permission for research received in the Research Committee of virtue and ethics Scientific Research Institute KRPOCH (protocol No. 023-2/SRIKRPOCH dated 10.08.2023). Informed consent was obtained from all the participants.

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