Artificial intelligence (AI) in Ukrainian Higher Education: A Comprehensive Study of Stakeholder Attitudes, Expectations and Concerns

Valentyna I. Bobrytska[*] iD
Mykhailo Drahomanov Ukrainian State University, Ukraine

Hanna V. Krasylnykova iD
Khmelnytskyi National University, Ukraine

Nataliia A. Beseda iD
Open International University of Human Development 'Ukraine', Poltava
Institute of Economics and Law, Ukraine,

Sergii R. Krasylnykov iD
Khmelnytskyi National University, Ukraine

Tetiana S. Skyrda iD
National Aviation University, Ukraine

Abstract. This study examines stakeholders' attitudes toward Artificial intelligence (AI) tools in Ukrainian higher education institutions, employing a comprehensive mixed-methods approach. The research combines qualitative focus group discussions, which involved a diverse range of participants, and a quantitative survey questionnaire distributed to a sizeable cohort. The quantitative data reveals a noteworthy trend, with a majority of stakeholders expressing positive attitudes toward AI integration, emphasising its potential for personalised learning and real-time feedback. This positive sentiment, however, is tempered by identified concerns, notably surrounding the accuracy of AI-generated content. The study establishes a connection with existing literature, affirming the widespread acceptance and benefits of AI in education. For a more nuanced understanding, a detailed breakdown of these quantitative results sheds light on the extent and distribution of stakeholder attitudes and concerns. Moreover, the qualitative component delves deeper into stakeholders' perspectives, capturing the richness of

[*]Corresponding author: *Valentyna I. Bobrytska, bobrytska@ukr.net*

their expressions. Concrete examples and direct quotes from participants in focus group discussions provide a qualitative dimension to the study's findings, offering insights into the nuances of stakeholders' viewpoints. To address these concerns, the research emphasises the need for tailored intervention plans, focusing on content quality, ethical implications and comprehensive training. These recommendations are rooted in a thorough analysis of both quantitative and qualitative data, providing practical insights for policymakers and institutions. In particular, the study highlights the importance of inclusive decision-making and targeted communication strategies, recognising role-based and age-related variations among stakeholders. By adopting a holistic approach to AI integration and acknowledging the interrelationships between attitudes, perceptions, expectations and concerns, this research provides a comprehensive guide for effectively leveraging AI while addressing associated concerns in higher education institutions.

1. Introduction

Artificial Intelligence (AI) has emerged as a transformative technology with the potential to revolutionise various aspects of society, including education, science, art and business (Laupichler et al., 2022; Ng et al., 2021; Wang et al., 2023). In recent years, there has been growing attention to and interest in AI tools, particularly in the educational sector, due to their ability to enhance teaching and learning experiences (Akinwalere & Ivanov, 2022; Cabinet of Ministers of Ukraine, 2021; Institute of Artificial Intelligence Problems, 2022). Higher education institutions in Ukraine are increasingly exploring the integration of AI tools into their educational environment to improve instructional methods, foster student engagement and enhance overall educational outcomes. AI can be applied in education through various means, such as adaptive learning systems, intelligent tutoring systems, learning analytics, and educational data mining (Marienko & Konoval, 2023).

However, the successful integration of AI tools in higher education requires careful consideration of stakeholders' attitudes towards this technological advancement. Stakeholders, including students and their parents, faculty members, administrators, alumni, future employers of graduates and policymakers, play a critical role in shaping the educational landscape and determining the acceptance and effectiveness of AI tools (Bobrytska et al., 2023). Thus, an understanding of the stakeholders' perspectives, concerns and expectations is vital for the successful implementation of AI technologies in higher education institutions in Ukraine and forms the gap for this study.

Objectives/Problems
This study extends beyond defined research objectives to elucidate fundamental problems guiding the investigation into AI integration in Ukrainian higher education, strategically influencing present and future educational landscapes.

Positive Contribution of AI to Quality Education in Ukraine:
This inquiry aims to detail how AI can contribute to quality education in Ukraine by improving teaching methodologies, fostering enriched learning experiences and contributing to the overarching goals of quality education.

Constructive Role of Various Parties in AI Implementation in Ukraine:
Acknowledging that successful AI integration requires a collaborative effort, this study defines the constructive roles of various stakeholders – students, faculty members, administrators, alumni, future employers and policymakers, essential for devising a comprehensive strategy for effective AI implementation in Ukrainian higher education.

Essentiality of Studying Stakeholder Attitudes, Expectations and Concerns:
Integral to this research is the exploration of stakeholder attitudes, expectations and concerns, recognised as linchpins in successful AI development and implementation, highlighting their role in shaping the landscape and acceptance of AI technologies in higher education.

Exploration of Stakeholder Attitudes, Expectations and Concerns for AI Development in Ukraine:
The researcher team's commitment extends to understanding not only why studying stakeholder perspectives is essential but also how this exploration is intrinsically linked to the broader development of AI in Ukraine. By unravelling the intricacies of stakeholder attitudes, expectations and concerns, the study contributes insights crucial for the strategic and effective deployment of AI technologies in Ukrainian higher education.

Literature Review
This literature review underscores the significant growth in publications addressing the challenges and opportunities of implementing AI in higher education (Chaudhry & Kazim, 2022). The 2018 EDUCAUSE Horizon report highlighted AI and adaptive learning technologies as crucial advancements in educational technology (Becker et al., 2018). Moreover, the 2019 report predicted an increasing adoption of AI by higher education institutions in the coming years, leveraging the potential of coexisting technologies for digital and physical resources (Alexander et al., 2019).

The rapid progress in AI has already left a substantial impact on higher education services (Popenici & Kerr, 2017) and academic programmes. Kuleto et al. (2021) suggest that AI can meet numerous social and educational demands of both higher education institutions and students. Consequently, faculty members and students in these institutions are increasingly using AI-powered tools and applications. AI-based technologies offer opportunities for personalised learning experiences, fostering greater motivation, engagement, and independence among students (Cox et al., 2019). Moreover, AI stimulates critical thinking and curiosity, enhancing the learning process and enabling educators to provide more engaging educational experiences (Alexander et al., 2019).

In April 2021, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) published 'AI and Education: Guidance for Policymakers' to enhance policymakers' readiness for AI implementation (Miao et al., 2021). This comprehensive guide introduces AI, covering its opportunities,

risks, key terminology, trends and implications for teaching and learning. It also addresses how learning institutions can prepare students for the AI era (UNESCO, 2022). The Beijing Consensus on Artificial Intelligence and Education (BCAIE) stresses the importance of AI literacy skills for effective human-machine collaboration while recognising the continued significance of foundational skills like literacy and numeracy (Miao et al., 2021). To cultivate a strong pool of local AI experts capable of designing, programming and developing AI systems, the BCAIE advises supporting higher education and research institutions in developing or enhancing courses and research programmes focused on AI (Miao et al., 2021). The literature emphasises the impact and importance of AI literacy in higher education institutions (Ng et al., 2021).

Role of Stakeholder Attitudes, Expectations and Concerns in AI Development in Ukrainian Higher Education

Stakeholders, including students and their parents, faculty members, administrators, alumni, future employers of graduates and policymakers, play a critical role in shaping the educational landscape and determining the acceptance and effectiveness of AI tools (Bobrytska et al., 2023). Understanding stakeholders' perspectives, concerns and expectations is vital for the successful implementation of AI technologies in higher education institutions in Ukraine.

Mendoza (2019) identifies four key areas of AI applications in education: (1) profiling and prediction; (2) intelligent tutoring systems; (3) assessment and evaluation; and (4) adaptive systems and personalisation. These applications align with the goals for AI in higher education, including improving outcomes, increasing access, enhancing retention, reducing costs and decreasing time to completion, as outlined by Bates (2018). Importantly, the literature on stakeholders' attitudes towards AI integration in higher education institutions in Ukraine is relatively limited. While global studies provide valuable insights, it is crucial to consider the cultural, social and institutional context of Ukraine, as these factors can influence stakeholders' perceptions and expectations.

Correlation between Attitudes, Expectations and Problems to AI Development in Ukrainian Higher Education

The correlation between stakeholders' attitudes, expectations and problems with AI development in Ukrainian higher education is a nuanced aspect that requires careful consideration. While the literature provides insights into the overarching impact of AI on education and the key areas of application, there is a noticeable gap in understanding how stakeholder attitudes and expectations correlate with the development of AI in Ukrainian higher education institutions. Global studies offer valuable insights, yet the cultural, social and institutional context of Ukraine must be considered to comprehensively assess this correlation. Addressing this gap is crucial for informing effective strategies that align with the unique dynamics of the Ukrainian educational landscape.

Thus, the purpose of this study was to bridge this research gap by examining the specific attitudes of stakeholders in Ukraine towards the integration of AI tools into the educational environment of higher education institutions. The research questions for this research were as follows:

1. What are the attitudes, perceptions expectations and concerns of stakeholders in Ukraine towards the integration of AI tools in higher education institutions?
2. Are there differences in stakeholders' attitudes, perceptions, expectations and concerns regarding the integration of AI tools in higher education institutions in Ukraine based on their role, gender and age?
3. Is there a correlation between stakeholders' attitudes towards AI tools and their concerns, perceptions of AI tools and their concerns, perceptions of AI tools and their expectations, and expectations and their concerns?
4. How do stakeholders perceive the relative advantage, compatibility, complexity, trialability and observability in the adoption of AI tools within higher education institutions?
5. What are the perspectives of stakeholders in Ukraine and globally regarding the role and impact of AI in the educational system?

2. Methodology

This study employed a mixed-methods approach, incorporating both qualitative and quantitative methods to ensure a nuanced exploration of stakeholders' attitudes towards the integration of AI tools into higher education institutions in Ukraine (Timans et al., 2019). The decision to use surveys as a quantitative method was underpinned by their suitability for capturing numerical data related to stakeholders' perceptions, attitudes, expectations and concerns. This method was selected based on recommendations by Cohen et al. (2017) and Glasow (2006), who highlighted its effectiveness in exploring existing conditions, establishing benchmarks and examining relationships between events. Surveys offer the advantage of providing inferential, descriptive and explanatory insights, and their capacity to be distributed anonymously to large populations ensures the collection of comprehensive data (Johnson & Onwuegbuzie, 2004). Using a Likert scale facilitated the assessment of stakeholders' agreement or disagreement with specific statements regarding AI integration. The subsequent statistical analyses, encompassing descriptive and correlation analysis, were conducted to discern overall trends and interrelationships among stakeholders' attitudes, perceptions, expectations and concerns.

Concurrently, the qualitative dimension involved conducting focus group discussions with selected stakeholders to delve deeper into their perspectives on the relative advantage, compatibility, complexity, trialability and observability of the adoption of AI tools. Qualitative methods were considered essential as they provided a platform to unearth the underlying reasons for stakeholders' attitudes and shed light on their experiences with AI tools in the educational environment. Thematic analysis and content analysis techniques were systematically applied to scrutinise the qualitative data, identify key themes and uncover patterns. By adopting this mixed-methods approach, the researchers strategically triangulated findings from both quantitative and qualitative data, thus strengthening the overall validity and reliability of the study. While surveys were deemed effective for capturing the breadth of stakeholders' sentiments, the qualitative component was instrumental in providing depth and context to the quantitative results, contributing to a more comprehensive understanding of the complex landscape surrounding AI integration in higher education.

The study received ethical approval from the Board of Academics at Dragomanov Ukrainian State University, affirming its adherence to ethical standards in research involving human participants. This approval underscores the commitment to safeguarding participants' rights, ensuring confidentiality and upholding ethical principles throughout the study.

Sample

The study employed a mixed sampling design encompassing both convenience and random sampling methods for internal and external stakeholders. Between December 2022 and February 2023, a convenience sampling approach was used to survey 993 internal university stakeholders, including students, faculty members, administrators, and various staff roles across 12 universities in Ukraine. Although this method facilitated efficient data collection, potential bias might arise as participants who volunteered could differ in attitudes from non-volunteers. This approach was chosen for its practicality and accessibility in gathering a substantial number of responses within a limited timeframe. Simultaneously, 291 external university stakeholders from 10 university alumni associations and 9 organizations in Ukraine were surveyed using a purposeful random sampling method. While random sampling for external stakeholders is appropriate, it may not fully represent all potential external stakeholders, potentially impacting the generalisability of the findings. Nonetheless, random sampling was selected to enhance objectivity and fairness in selecting external participants.

The list of universities participating in the survey included Dragomanov Ukrainian State University (DUSU), Bogomolets National Medical University (BNMU), Sumy State Pedagogical University (SSPU), National Aviation University (NAU), Lviv Polytechnic National University (LPNU), The National Technical University of Ukraine 'Igor Sikorsky Kyiv Polytechnic Institute' (NTUU), State University of Infrastructure and Technologies (SUIT), State University of Trade and Economics (SUTE), Kyiv National Economic University named after Vadym Hetman (KNEU), National University of Kyiv Mohyla Academy (NUKMU), Taras Shevchenko National University of Kyiv (TSNUK), and Kyiv National Linguistic University (KNLU).

Organisations whose representatives participated in the survey included the Ministry of Education and Science of Ukraine (MESU), OilGroup (Ukraine), 'Silpo' Supermarket Chain, AB InBev Efes (Ukraine), Bayer AG (Ukraine), Teva Ukraine, Raiffeisen Bank (Ukraine), DTEK Energo (Ukraine), and Coca-Cola (Ukraine). The selection of external samples was a deliberate process, aiming to ensure a comprehensive representation of perspectives relevant to the research. The external stakeholders surveyed were chosen strategically to include parents, policymakers, representatives of partner organisations, future employers, donors and former students, enriching the study with diverse viewpoints. The surveyed alumni associations and organisations were selected based on their potential impact on or involvement in the higher education landscape. This approach ensured that the study encompassed a broad spectrum of perspectives, contributing to the robustness and relevance of the research findings.

Table 1 presents a breakdown of the sample according to current role in relation to the higher education institution, gender and age.

Table 1: Distribution of the Stakeholder Population According to Their Current Role in Relation to the Higher Education Institution, Gender and Age

Variable		Category	*n*	%
Role by Type of the Stakeholder	Internal, *n* = 993 (77.33%)	Student	233	23.46
		Parent	113	11.37
		Faculty member	329	33.13
		Administrator	75	7.55
		Academic Support Staff	51	5.11
		Researcher	58	5.84
		IT Support Staff	34	3.42
		Curriculum Developer	19	1.92
		Quality Assurance Officer	24	2.42
		Career Services Officer	13	1.31
		Student Counsellor	23	2.32
		Public Relations Officer	21	2.12
	External, *n* = 291 (22.67%)	Policymaker	7	2.41
		Partner Organisation Representative	35	12.02
		Future Employer	82	28.17
		Alumni	161	55.33
		Donor (investor)	4	1.38
		Other Interested Entity	2	0.69
Gender		Male	391	30.45
		Female	893	69.54
Age		17 to 30 years	314	24.45
		31 to 40 years	242	18.85
		41 to 50 years	427	33.26
		More than 50 years	301	23.44
Total			1284	100

Data Collection and Analysis

For data collection, this study used two researcher-designed questionnaires: a survey questionnaire on stakeholders' attitudes, perceptions, expectations and concerns regarding the integration of AI tools in higher education institutions in Ukraine (see Appendix A) and a focus group discussion questionnaire (see Appendix B). The survey questionnaire was disseminated through various electronic channels, including university emails, WhatsApp, Viber, Telegram groups and Facebook Messenger, to invite stakeholders to participate in the study. Focus group discussions were conducted in Ukrainian using virtual platforms such as Zoom or Google Meet. These discussions were recorded and transcribed using Happy Scribe (accessible via: https://www.happyscribe.com/), an online software supporting multiple languages, including Ukrainian. The transcriptions were accurately edited to ensure accuracy and clarity. Common themes and patterns emerging from the interview data were identified, and segments corresponding to these themes were systematically coded for analysis. A comparative analysis was then performed to identify similarities, differences and contradictions in participants' perspectives and experiences.

The Ukrainian version of the survey questionnaire consisted of four sections with closed-ended questions following demographic inquiries, including the participant's role in relation to the higher education institution, gender and age,

comprising a total of 33 questions. To ensure face and content validity, the questionnaire underwent thorough review and moderation by five volunteer colleagues with PhD and Doctor of Science degrees in Education. Their feedback was thoughtfully considered, and the questionnaire was edited and refined accordingly. Face validity was assessed by the aforementioned colleagues using a Likert scale ranging from 1 to 5, while construct validity and internal consistency were evaluated using a 5-point Likert scale. The raters had the authority to modify items in the questionnaire for improvement purposes. The survey questionnaire demonstrated good inter-rater agreement, with an item-level content validity index (IL-CVI) of 0.971 and Fleiss's Kappa coefficient of 0.524.

After the pilot survey involving 37 volunteer faculty members, Reliability Analysis tests were administered, and Cronbach's alpha was calculated for each section. The first section, exploring stakeholders' attitudes towards AI tools, comprised 9 items ($\alpha = 0.818$), the second section covered stakeholders' perceptions of AI tools with 10 items ($\alpha = 0.943$), the third section addressed stakeholders' expectations concerning the use of AI tools with 7 items ($\alpha = 0.921$), and the fourth section focused on stakeholders' concerns regarding the use of AI tools with 7 items ($\alpha = 0.843$). Following the pilot survey involving 37 volunteer faculty members, reliability statistics were administered and Cronbach's alpha was calculated for each section. The first section, exploring stakeholders' attitudes towards AI tools, comprised 9 items ($\alpha = 0.818$), the second section covered stakeholders' perceptions of AI tools with 10 items ($\alpha = 0.943$), the third section addressed stakeholders' expectations concerning the use of AI tools with 7 items ($\alpha = 0.921$), and the fourth section focused on stakeholders' concerns regarding the use of AI tools with 7 items ($\alpha = 0.843$).

The focus group discussion questionnaire consisted of 15 open-ended questions, which were discussed online with four groups, each consisting of four individuals. Similar to the survey questionnaire, the focus group discussion questionnaire underwent validation and demonstrated good face and content validity, and inter-rater agreement, with an item-level content validity index (IL-CVI) of 0.923 and Fleiss's Kappa coefficient of 0.442. Overall, both researcher-designed instruments exhibited good agreement among the experts, as found by Yusoff (2019), indicating their reliability and appropriateness for use in the study as statistical measures.

The analysis of numerical data obtained from the survey involved using the Jamovi computer software (version 2.2.5) (Jamovi, 2021). The quantitative approach included descriptive analysis to explore existing conditions, establish benchmarks and examine relationships between events. Moreover, inferential analysis was employed to derive insights into the overall trends and interrelationships among stakeholders' attitudes, perceptions, expectations and concerns. The survey employed a Likert scale to gauge stakeholders' agreement or disagreement with specific statements related to AI integration, and statistical analyses, encompassing descriptive and correlation analysis, were conducted. In the qualitative facet, focus group discussions were conducted to delve deeper into stakeholders' perspectives concerning the relative advantage, compatibility, complexity, trialability and observability in the adoption of AI tools. The qualitative data underwent thematic analysis and content analysis techniques.

The thematic analysis involved identifying, analysing and reporting themes within the data, while content analysis focused on systematically coding and categorising segments of the data. Through these rigorous techniques, common themes and patterns emerging from the qualitative data were identified, providing a comprehensive understanding of stakeholders' experiences and perspectives.

To ensure the accuracy and credibility of the findings, the study adopted a triangulation approach, combining both quantitative and qualitative data. This methodological strategy enhances the reliability and validity of the study by cross-verifying findings from different data sources, offering a more robust and comprehensive interpretation of the research outcomes. Triangulation contributed to the trustworthiness of the study, aligning with the principles of methodological rigour and enhancing the overall quality of the research analysis.

3. Results

The survey results reveal a nuanced perspective among stakeholders regarding AI tools in education. While stakeholders generally expressed positive views, underscored by their familiarity with AI (A1: $M = 3.86, SD = 1.125$) and belief in its potential to enhance teaching and learning (A2: $M = 3.76, SD = 1.041$), certain reservations emerged. Stakeholders exhibited a favourable disposition toward using AI technology (A3: $M = 4.14, SD = 1.030$), yet concerns surfaced, particularly regarding the accuracy and reliability of AI educational content (A4: $M = 3.22, SD = 1.200$) and a general unease about AI utilisation (A7: $M = 2.26, SD = 1.175$).

In terms of perceptions, stakeholders displayed varying levels of confidence in using AI tools (P2: $M = 2.08, SD = 0.916$) and expressed concerns about the ethical implications of AI (C1: $M = 3.20, SD = 1.309$). Positive expectations included the belief that AI could enhance interactivity in education (P4: $M = 3.80, SD = 1.069$) and reduce costs in higher education institutions (P6: $M = 3.56, SD = 1.033$). Stakeholders anticipated increased student engagement (E1: $M = 3.60, SD = 1.030$) and expected Ukrainian higher education institutions to adopt AI for competitive reasons (E2: $M = 3.60, SD = 1.107$), coupled with an expectation for support and training in effectively using AI tools (E4: $M = 3.56, SD = 1.110$).

However, concerns persisted, including worries about AI replacing human instructors (C3: $M = 3.10, SD = 1.374$) and uncertainties about the resources needed for effective AI implementation (C4: $M = 3.40, SD = 1.229$). These findings highlight stakeholders' receptiveness to AI in education while emphasising specific apprehensions and areas requiring additional support. Understanding this nuanced perspective is crucial for developing targeted AI integration strategies that cater to stakeholders' needs and address their concerns effectively.

Figure 1 illustrates the diverse perspectives of respondents, categorised by their roles, on the integration of AI tools in Ukrainian higher education institutions. Faculty members ($M = 4.33$) exhibit notably favourable attitudes, while future employers ($M = 2.87$) and donors ($M = 1.78$) show more reserved outlooks. Variations in perceptions are evident, with quality assurance officers ($M = 1.96$) and donors ($M = 2.32$) expressing lower confidence in AI tool utilisation

compared to alumni ($M = 4.75$) and student counsellors ($M = 3.65$). Expectations also differ, as faculty members ($M = 3.32$) and researchers ($M = 4.13$) hold considerable optimism, whereas parents ($M = 2.22$) and future employers ($M = 2.57$) are less optimistic. Concerns vary across roles, with policymakers ($M = 4.55$) and donors ($M = 4.53$) expressing higher levels, while faculty members ($M = 4.22$) and curriculum developers ($M = 3.11$) have fewer apprehensions. These nuanced findings underscore role-dependent perspectives, with faculty and researchers being enthusiastic, and parents and future employers adopting a more cautious stance. Policymakers and donors, potentially due to a comprehensive understanding of benefits, exhibit heightened concerns about AI integration.
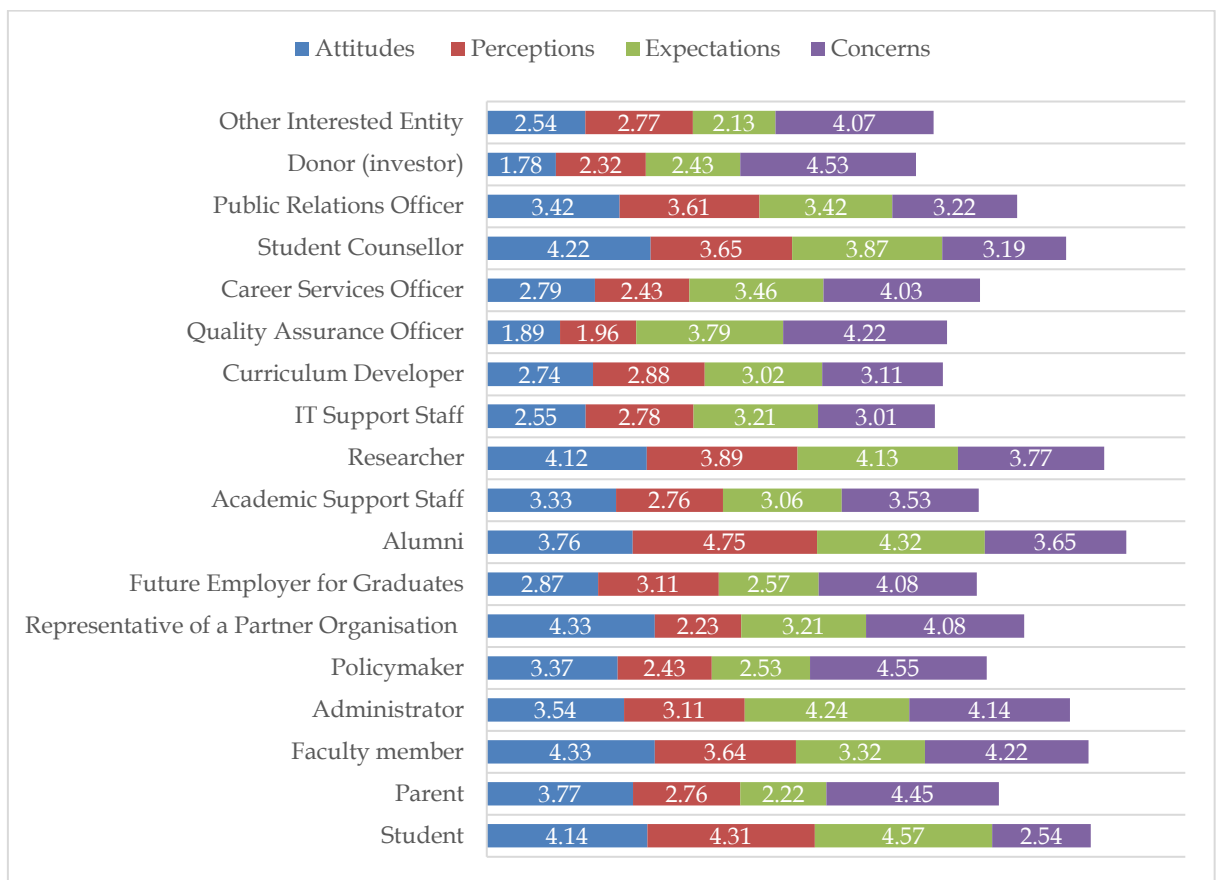
Figure 1: Distribution of Respondents' Attitudes, Perceptions, Expectations and Concerns Expressed as Mean Averaged Based on their Role

Figure 2 presents the distribution of respondents' attitudes, perceptions, expectations and concerns regarding the integration of AI tools in higher education institutions in Ukraine, based on their gender.
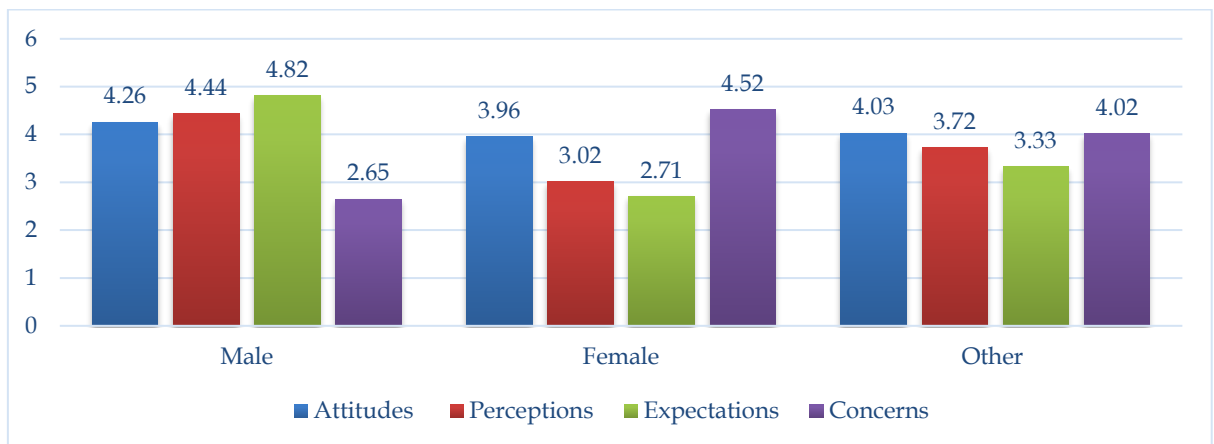
Figure 2: Gender-Based Comparison of Attitudes, Perceptions, Expectations and Concerns

As can be seen in Figure 2, male respondents ($M = 4.26$) demonstrated a slightly more positive attitude towards the integration of AI tools compared to female respondents ($M = 3.96$) and respondents who identified themselves as 'Other' ($M = 4.03$). Male respondents ($M = 4.44$) reported a higher level of confidence in their ability to proficiently utilise AI tools compared to female respondents ($M = 3.02$) and respondents who identified as 'Other' ($M = 3.72$). With regard to expectations, male respondents ($M = 4.82$) had higher expectations regarding the potential benefits of AI integration in higher education institutions compared to female respondents ($M = 2.71$) and respondents who identified as 'Other' ($M = 3.33$). As for the concerns, male respondents ($M = 2.65$) expressed slightly fewer concerns regarding the integration of AI tools compared to female respondents ($M = 4.52$) and respondents who identified as 'Other' ($M = 4.02$). The differences in mean scores between the gender groups for attitudes, perceptions, expectations and concerns were statistically significant.

The analysis of age groups revealed significant variations in stakeholders' attitudes, perceptions, expectations and concerns regarding the integration of AI tools in higher education institutions in Ukraine (see Figure 3).
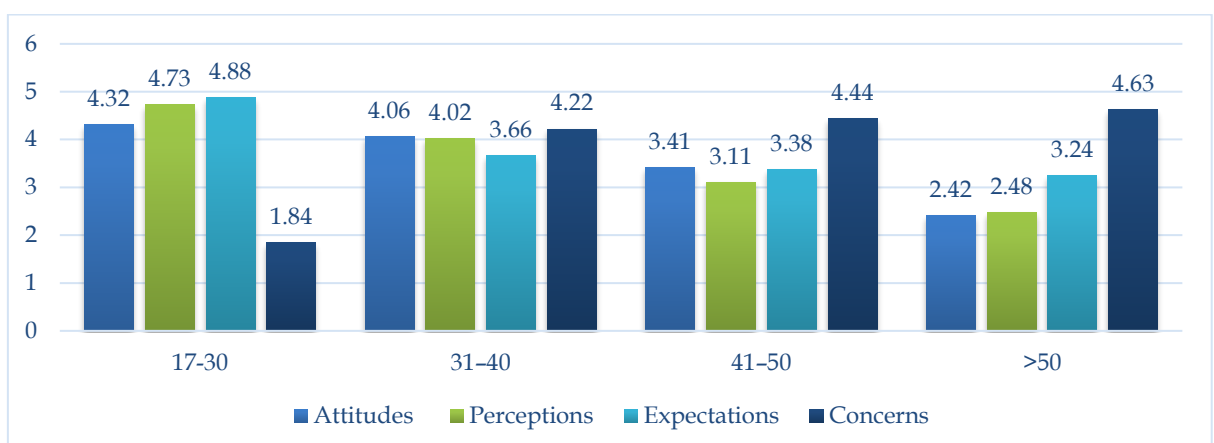
Figure 3: Age-Based Comparison of Attitudes, Perceptions, Expectations and Concerns

Figure 3 presents age-based comparisons of stakeholders' attitudes, perceptions, expectations and concerns regarding AI integration in Ukrainian higher education

institutions. Respondents aged 17-30 years (M = 4.32) displayed the most positive attitudes and highest optimism, while those over 50 (M = 2.42) had the least favourable attitudes. In perceptions, the 17-30 age group (M = 4.73) showed the highest confidence in utilising AI tools, contrasting with respondents over 50 (M = 2.48) who exhibited lower confidence. Expectations were highest in the 17-30 age group (M = 4.88), anticipating significant benefits, while those over 50 (M = 3.24) had lower expectations. Concerns were most pronounced in respondents over 50 (M = 4.63), indicating substantial worries about AI integration challenges. Younger respondents tend to be more positive, confident and expectant about AI integration, while older individuals, especially those over 50, approach it more cautiously, reflecting potential generational differences in technology receptivity and concerns about AI implications.

The correlation matrix presented in Table 3 displays the relationships between the various study variables. The table contains correlation coefficients (Pearson's r, Spearman's rho, and Kendall's Tau B) along with their corresponding p-values.

Table 3: Correlation Matrix of the Relationships Between the Variables in the Study

		Attitudes	Perceptions	Expectations	Concerns
Attitudes	Pearson's r	—			
	p-value	—			
	Spearman's rho	—			
	p-value	—			
	Kendall's Tau B	—			
	p-value	—			
Perceptions	Pearson's r	0.574*	—		
	p-value	0.015	—		
	Spearman's rho	0.555*	—		
	p-value	0.038	—		
	Kendall's Tau B	0.546*	—		
	p-value	0.027	—		
Expectations	Pearson's r	0.620*	0.799***	—	
	p-value	0.045	< .001	—	
	Spearman's rho	0.641*	0.759***	—	
	p-value	0.042	< .001	—	
	Kendall's Tau B	0.635*	0.706***	—	
	p-value	0.019	< .001	—	
Concerns	Pearson's r	0.733*	0.575*	0.392*	—
	p-value	0.053	0.058	0.052	—
	Spearman's rho	0.733*	0.591*	0.386*	—
	p-value	0.053	0.089	0.053	—
	Kendall's Tau B	0.727*	0.577*	0.372*	—
	p-value	0.054	0.077	0.059	—

*Note: * p < .05, ** p < .01, *** p < .001*

Table 3 presents the correlation analysis, revealing key insights into the interplay among attitudes, perceptions, expectations and concerns regarding AI integration in higher education. Notably, attitudes show no significant correlations ($p > 0.05$) with other variables, indicating their relative independence. However, perceptions exhibit a moderate positive correlation with attitudes ($p < 0.05$), suggesting that positive perceptions align with positive attitudes. Expectations strongly correlate with attitudes ($p < 0.001$), emphasising that high expectations of AI benefits coincide with positive attitudes. Expectations also display a very strong positive correlation with perceptions ($p < 0.001$), underscoring the connection between anticipated benefits and current perceptions. Concerns, meanwhile, show a strong positive correlation with attitudes ($p < 0.05$), implying that heightened concerns relate to less positive attitudes. Additionally, moderate positive correlations exist between concerns and perceptions ($p < 0.1$), indicating that elevated concerns align with less favourable perceptions. Interestingly, no significant correlations are observed between concerns and expectations, suggesting that the level of concern is not associated with anticipated benefits. In summary, stakeholders' attitudes appear largely independent, influenced notably by perceptions and concerns. Expectations play a pivotal role, tightly connected to attitudes and perceptions. Recognising these dynamics is crucial for crafting effective AI integration strategies in higher education, acknowledging the intricate relationships between perceptions, expectations and concerns shaping stakeholder attitudes.

Key Findings from Focus Group Discussions
Thematic analysis of focus group discussions illuminated crucial insights on AI integration in higher education:

University Professors and Students:
Optimism and Personalisation: Professors and students are optimistic about AI's potential to enhance learning. Personalised learning pathways and real-time feedback are emphasised, catering to individual student needs.

Potential Investors:
Productivity and Competitiveness: Investors recognise AI's potential to enhance institutional productivity and attract tech-savvy students, ultimately increasing the competitiveness of higher education institutions.

Ministry of Education Representative and Future Employers for Graduates:
Data-Driven Decision-Making: The Ministry of Education representative and future employers highlight AI's role in data-driven decision-making, fostering innovation and responsiveness to student needs, leading to improved educational outcomes.

Challenges in AI Integration:
Mixed Perspectives: While optimism prevails, challenges are acknowledged. Future employers and curriculum developers emphasise hurdles in AI integration, including faculty training, infrastructure investment and skill alignment. This dual acknowledgement reflects the complexity of creating AI-compatible curricula and adaptive learning pathways.

Data Privacy and Ethical Considerations:
Concerns and Safeguards: Both students and potential investors express concerns about data privacy and ethical considerations in AI adoption. Transparent data usage policies and ethical guidelines are stressed by students, while investors emphasise measures for data security and user privacy during AI technology implementation in education.

Importance of Faculty Training and Collaboration:
Critical Factors: Curriculum developers and quality assurance officers highlight the critical role of faculty training and collaboration with AI providers for successful AI adoption. This underscores the need for effective faculty training and collaboration with AI experts and industry professionals to ensure a seamless integration process.

This tree diagram (see Figure 4) illustrates the diverse perspectives of stakeholders regarding the integration of AI tools in higher education institutions.
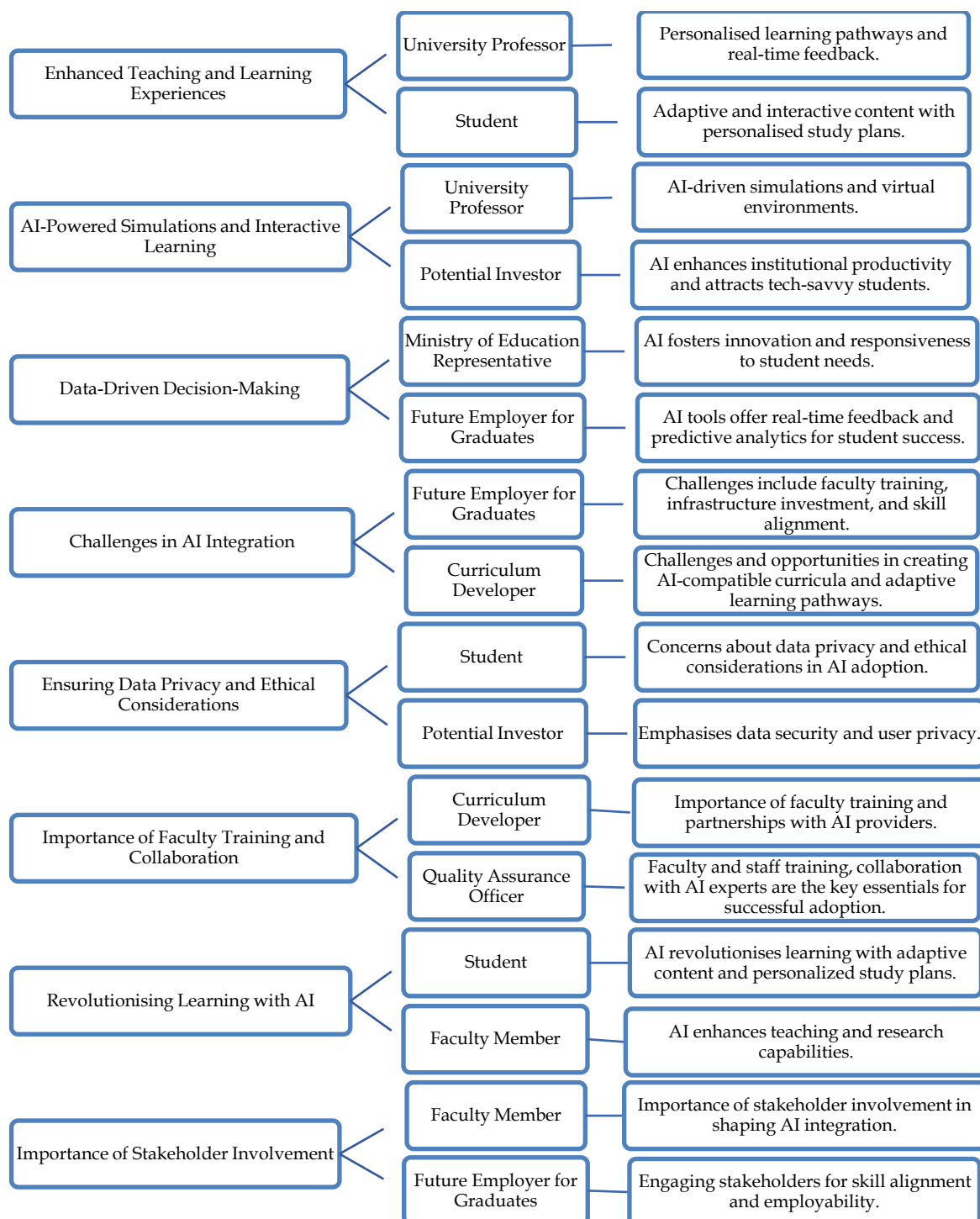
Figure 4: Thematic Analysis of Stakeholders' Perspectives on the Integration of AI Tools in Higher Education Institutions

While this study predominantly emphasises the positive aspects of AI integration based on the optimistic perspectives of stakeholders, it is essential to acknowledge and integrate diverse viewpoints for a comprehensive understanding. In the interest of providing a balanced and unbiased representation, future research endeavours will incorporate a more in-depth exploration of negative or critical perspectives towards AI integration in education. This inclusion will contribute

to a more nuanced and holistic interpretation of stakeholder sentiments, fostering a well-rounded discussion on the challenges and drawbacks associated with AI adoption in the higher education landscape.

The study's fifth research question addressed the diverse perspectives of stakeholders in Ukraine regarding the role and impact of AI in education. Internal university stakeholders generally held positive views on AI, citing familiarity and belief in its enhancing potential. However, concerns existed, notably about the accuracy of AI educational content and unease regarding its utilisation, including worries about replacing human instructors. Anticipated benefits included increased interactivity, cost reduction, enhanced student engagement and the expectation of AI adoption for competitiveness.

Stakeholders' perspectives varied by role, with faculty and researchers exhibiting more favourable attitudes than future employers and donors. Policymakers and donors expressed higher concerns, potentially due to a deeper understanding of associated benefits. Importantly, these findings are specific to Ukraine and may not directly apply globally, considering cultural, contextual, and systemic differences in other countries' educational systems.

Ethical Considerations and Data Privacy

The study underwent ethical review and approval to ensure compliance with ethical standards. Measures were implemented to ensure the privacy and confidentiality of participants' data. Additionally, concerns about data privacy were raised during focus group discussions, emphasising the importance of transparent data usage policies and ethical guidelines. By addressing these points, the revised results section provides a more comprehensive and transparent presentation of the study's methodology and findings, considering the reviewer's valuable feedback.

4. Discussion

The exploration of stakeholders' attitudes, perceptions, expectations and concerns toward AI integration in Ukrainian higher education institutions revealed a complex tapestry of perspectives. A distinctive aspect of this study is its inclusive approach, considering a diverse array of stakeholders ranging from faculty members to potential investors. The nuanced analysis of these perspectives offers valuable insights for institutions and policymakers navigating the landscape of AI implementation in education.

In acknowledging the study's limitations, it is crucial to recognise potential constraints that might impact the robustness of the findings. The sample size, while substantial, could introduce certain biases, particularly given the convenience sampling method. The discussion should delve into the implications of this sampling approach, exploring how participant self-selection might have influenced the outcomes. Additionally, constraints in data collection, such as resource limitations or time constraints, need explicit mention to offer a comprehensive understanding of the study's scope and potential areas for improvement in future research endeavours.

The study's emphasis on Ukraine's higher education landscape prompts a crucial reflection on the broader applicability of its findings. While the insights gleaned

from Ukrainian stakeholders offer invaluable perspectives on AI integration within this specific context, the question of generalisability emerges. A thoughtful examination of whether comparable studies conducted in diverse educational settings align with or diverge from the presented findings becomes imperative. Considering the unique nuances of the Ukrainian context, it becomes essential to scrutinise potential factors that might influence the transferability of these results to global or regional educational environments. By addressing these questions, the study not only contributes to the understanding of AI integration in Ukrainian higher education but also enriches the discourse on the universality of its findings, thereby enhancing the study's relevance on a broader scale.

Delving into the policy implications of the study's findings offers a valuable avenue for enhancing the practical relevance of the research. Beyond the brief mention of actionable recommendations, a more comprehensive exploration is warranted to elucidate how the research findings can directly inform policies related to AI integration in Ukrainian higher education institutions. What specific changes or guidelines might be proposed based on the nuanced attitudes, concerns and expectations identified among stakeholders? Providing a detailed examination of these policy implications not only enriches the discussion but also equips policymakers and institutions with actionable insights to navigate the complex landscape of AI integration in education. By elucidating the direct application of the study's outcomes in shaping policies, the research becomes an instrumental resource for decision-makers seeking to align educational practices with stakeholder perspectives on AI technology.

One compelling revelation is the role-dependent nature of attitudes. Faculty members, as key players in the educational process, exhibited notably positive attitudes (M = 4.33). In contrast, future employers (M = 2.87) and donors (M = 1.78) expressed more reserved outlooks. This dichotomy underscores the need to recognise the varied roles stakeholders play and tailor strategies accordingly. Policymakers and donors, while exhibiting heightened concerns, also demonstrate a nuanced understanding, likely stemming from a comprehensive grasp of associated benefits. An intriguing dimension is the gender-based variation in stakeholder perspectives. Male respondents displayed a slightly more positive attitude, higher confidence and greater expectations compared to their female counterparts. This statistically significant difference prompts a closer examination of how gender dynamics intersect with perceptions of AI in education, shedding light on potential areas for targeted interventions or support. The study uncovered distinct trends across age groups. Younger respondents (17–30 years) showcased more positive attitudes, higher confidence and greater expectations toward AI integration, suggesting a generational predisposition towards technology acceptance. Conversely, individuals over 50 displayed more caution and concern. This age-related divergence emphasises the need for adaptive approaches, recognising varying comfort levels with AI across different age cohorts.

While the overall sentiment toward AI was positive, stakeholders voiced specific concerns that demand strategic attention. Worries about the accuracy and reliability of AI-generated educational content underscore the necessity for stringent validation processes. The unease surrounding AI's role in teaching

necessitates a communication strategy emphasising AI as a complementary tool rather than a replacement for human instructors. Stakeholders' moderate confidence in using AI tools signals a demand for targeted training initiatives to fully unlock the benefits of AI integration.

A crucial aspect that emerged is stakeholders' heightened awareness of ethical considerations and data privacy. This aligns with broader societal discussions and resonates with existing literature. Robust data governance policies become imperative to address these concerns, emphasising the need for transparent and ethical AI practices. The correlation analysis provides a deeper understanding of the interplay between key variables. Positive correlations between attitudes, perceptions and concerns underscore the interdependence of these facets. Notably, expectations did not significantly correlate with concerns, suggesting that apprehensions may stem from considerations beyond anticipated benefits or current perceptions. Insights from thematic analysis highlight diverse perspectives gained from focus group discussions. The recognition of potential benefits, expression of concerns and emphasis on stakeholder involvement collectively emphasise the need for a balanced, well-informed and inclusive approach to AI implementation.

The concerns about AI integration that were also evident in this study reflect common themes found in the existing literature (Enholm et al., 2022; Celik et al., 2022; Seo et al., 2023). The reservations expressed by stakeholders about the accuracy and reliability of AI-powered educational content, as well as unease about the use of AI, resonate with previous research on the challenges of AI adoption in education.

The findings align with existing literature on the integration of AI tools in higher education institutions (AlDhaen, 2022; Chatterjee & Bhattacharjee, 2020; Siau & Ma, 2018). Like previous studies, the current research acknowledges the potential benefits of AI in enhancing teaching and learning experiences (Hussain, 2020; Scott et al., 2021). Stakeholders in this study expressed positive attitudes towards AI tools, which is consistent with other research that has highlighted the growing acceptance of AI technology in educational settings.

Generally, the findings of this study complement and reinforce the existing literature on AI integration in higher education (Crompton & Burke, 2023; Ouyang & Jiao, 2021). By offering a more comprehensive understanding of stakeholders' perspectives and their interrelationships, the research provides valuable insights for institutions and policymakers aiming to harness the potential of AI while addressing concerns and challenges in a holistic manner.

In considering the practical applications of this study, higher education institutions in Ukraine can leverage these findings to make informed decisions about AI integration. By understanding the role-dependent nature of attitudes, institutions can tailor their strategies to different stakeholders. Faculty members, who exhibit notably positive attitudes, can be early adopters and advocates, potentially becoming champions of AI integration within the educational process. On the other hand, future employers and donors, who express more reserved outlooks, may benefit from targeted engagement and communication strategies to address their concerns and build support for AI initiatives.

Moreover, the gender and age-based variations in stakeholder perspectives highlight the importance of considering diverse demographics when implementing AI tools. Institutions can design inclusive training programmes that address varying comfort levels and expectations among different gender and age groups. For instance, recognising the higher confidence and expectations among male respondents, institutions can tailor training initiatives to ensure they capitalise on this positive disposition.

The concerns voiced by stakeholders regarding the accuracy and reliability of AI-generated educational content signal a need for institutions to prioritise robust content validation processes. Implementing stringent measures and involving subject matter experts in the development and evaluation of AI content can enhance the credibility and acceptance of AI tools in education. The unease surrounding AI's role in teaching also underscores the importance of effective communication strategies. Institutions can develop communication plans that emphasise AI as a complementary tool, highlighting its potential to enhance, rather than replace, human instructors. This approach can help mitigate concerns and foster a more positive perception of AI integration.

The study's findings on ethical considerations and data privacy awareness call for proactive measures. Higher education institutions can develop and implement robust data governance policies that prioritise transparency and ethical AI practices. Establishing clear guidelines for the ethical use of AI in education, along with mechanisms to address concerns and ensure data privacy, will contribute to building trust among stakeholders.

In summary, the practical applications of this study for higher education institutions in Ukraine include tailoring strategies to the role-dependent attitudes of stakeholders, designing inclusive training programmes, implementing robust content validation processes, developing effective communication strategies and establishing comprehensive data governance policies. By aligning their strategies with stakeholders' expectations and concerns, institutions can navigate the complexities of AI integration in education and harness its potential to enhance the teaching and learning experiences.

5. Conclusions

The findings revealed predominantly positive attitudes towards AI tools among stakeholders, who acknowledged the potential for enhancing teaching and learning experiences through personalised pathways and real-time feedback. Despite this overall positive sentiment, certain reservations and concerns emerged, particularly regarding doubts about the accuracy of AI-generated content and unease about its application in educational settings. The study's alignment with existing literature reaffirms the growing acceptance of AI technology in education and underscores its potential benefits. To ensure successful AI implementation, it is imperative to address the identified concerns, especially those related to content quality, ethical implications and the necessity for comprehensive training. Strategic interventions tailored to the specific needs of stakeholders should prioritise student engagement and align with institutional goals, meeting the diverse expectations of stakeholders. The observed role-based variations and age-related differences in attitudes underscore the importance of inclusive decision-making and the implementation of targeted communication

strategies. A critical aspect highlighted in this study is the interrelationships between attitudes, perceptions, expectations and concerns, emphasising the need for a holistic approach to AI integration. The study identifies specific barriers and challenges resonating with previous research, placing particular emphasis on faculty training, data privacy, stakeholder engagement and alignment with job market demands. To further enrich the understanding of AI integration, an in-depth analysis of the ratio between artificial intelligence tools and human creativity is recommended. Investigating this dynamic relationship will provide valuable insights into how AI technologies can complement human creativity in educational contexts. By comprehensively examining stakeholders' perspectives and interrelated factors, this research not only contributes to the existing body of knowledge but also provides valuable guidance for policymakers and institutions seeking to harness AI's potential while effectively addressing concerns and challenges. The study calls for ongoing efforts to strike a balanced integration, ensuring that AI enhances, rather than replaces, the creative and critical aspects of education.

6. Limitations

The survey findings unveiled a diverse spectrum of attitudes, perceptions and expectations alongside concerns regarding AI technology adoption in Ukrainian higher education institutions. While these insights offer valuable contributions, it is crucial to acknowledge contextual limitations. Generalising these findings to countries with distinct contexts, cultures, or educational systems must be approached cautiously due to their potential influence on stakeholders' perspectives on AI integration.

To address sampling bias, additional analyses assessed the impact of sampling methods on results. Despite potential bias from convenience sampling, descriptive statistics revealed significant variations in stakeholders' attitudes, perceptions, expectations and concerns regarding AI tools in Ukrainian higher education institutions based on factors like roles, gender and age. External stakeholders were sampled using random methods, an improvement over convenience sampling but not fully comprehensive. Efforts were made to mitigate non-response bias inherent in convenience sampling, but strategies to explicitly address this bias were not detailed, affecting the study's representativeness and generalizability.

Recognising potential response bias from self-reported data in surveys and focus group discussions is crucial, as participants may offer socially desirable responses, potentially impacting the accuracy of their attitudes and behaviours reflected in the study. While this study provides valuable insights, its limitations warrant consideration. The cross-sectional design restricts the ability to infer causation or observe longitudinal changes in attitudes. Additionally, convenience sampling introduces biases and limits generalisability. A more comprehensive discussion on the study's scope and boundaries would provide transparency about the explored facets and those potentially left unexamined

Recommendations

Practical Implications for the Educational System in Ukraine

Comprehensive Policy Development: Stakeholders in the educational system of Ukraine are encouraged to collaborate on the development of comprehensive policies and guidelines. These should address key concerns raised in the study, such as data privacy, ethical considerations and transparent data usage in the implementation of AI technologies.

Tailored Training Initiatives: To address the moderate confidence stakeholders expressed in utilising AI tools, institutions should design and implement targeted training initiatives. These programmes should equip educators and staff with the skills necessary to maximise the benefits of AI integration in education.

Communication Strategies: A clear and transparent communication strategy should be adopted, emphasising the role of AI as a complementary tool rather than a replacement for human instructors. This is vital to address concerns about the impact of AI on traditional teaching methods.

Research Directions for Ukraine and Beyond

Environmental and Cultural Analysis: Future research should delve into the impact of the national and local environment, as well as cultural factors, on the adoption and efficacy of AI tools in education. Understanding the role of these contextual elements is crucial for tailoring AI implementation strategies to specific regions.

Long-term Effects of AI Integration: Researchers are encouraged to explore the long-term effects of AI integration in educational systems, both in Ukraine and globally. This includes investigating its influence on teaching methodologies, learning outcomes and the future of jobs in the context of evolving AI technologies.

Analysis of AI and Human Creativity: A focused investigation into the ratio of artificial intelligence and human creativity is recommended. This should include an examination of the future employment landscape, the evolving role of teachers and trainers, and the potential synergies or tensions between AI tools and human creativity.

Comparative Studies: Comparative analyses should be conducted to understand how findings from this study align with or diverge from similar studies in different educational settings. This will contribute to a broader understanding of the generalisability of the study's findings.

By concurrently addressing practical considerations for the Ukrainian educational system and suggesting research directions, these recommendations aim to guide both immediate actions and future scholarly inquiries in the realm of AI integration in education.

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Appendices

Appendix A. Survey Questionnaire on Stakeholders' Attitudes, Perceptions, Expectations, and Concerns Regarding the Integration of AI Tools in Higher Education Institutions in Ukraine (Ukrainian language version is available at: https://forms.gle/TX2xjSNtTR3mFW2LA)

1) What is your current role in relation to the higher education institution? Please select the option that best represents your role:

Student
Parent
Faculty member
Administrator
Policymaker
Representative of a Partner Organisation for the University
Future Employer for Graduates
Alumni

Academic Support Staff
Researcher
IT Support Staff
Curriculum Developer
Quality Assurance Officer
Career Services Officer
Student Counsellor
Public Relations Officer
Donor (investor)
Other Interested Entity

Your gender: ☐ Male; ☐ Female; ☐ Other
Your age: _____

Item	Likert 5-point Agreement Scale				
	1	2	3	4	5
Stakeholders' Attitudes Towards AI Tools					
1 I am familiar with the concept of AI and its potential applications in the field of education.					
2 I strongly believe that integrating AI tools in higher education institutions can greatly enhance the quality of teaching and learning experiences.					
3 I find using AI technology to be enjoyable and engaging.					
4 I have reservations about the accuracy and reliability of AI-powered educational content.					
5 I am able to utilise AI technology to accomplish tasks at a faster pace.					
6 I derive satisfaction from using AI technology.					
7 I experience a sense of unease or discomfort when considering the use of AI.					
8 When contemplating the capabilities of AI, I am concerned about the potential challenges it may pose for my future.					
9 Learning AI technology requires significant effort and dedication on my part.					
Stakeholders' Perceptions of AI Tools					
1 I perceive AI technology as intricate and not easily comprehensible.					
2 I have confidence in my ability to proficiently utilise AI tools in my current role.					
3 I believe that integrating AI tools in higher education institutions can facilitate increased access to education for underrepresented groups.					
4 I believe that incorporating AI in higher education will enhance the interactive nature of education.					

5	I believe that AI tools have the potential to personalise the learning experience for individual students.
6	I think that AI tools can contribute to cost reduction in higher education institutions.
7	I think that the integration of AI tools in higher education institutions can foster a more innovative and forward-thinking educational environment.
8	I am of the opinion that the integration of AI tools in higher education institutions can enhance educational outcomes.
9	I am open to embracing new AI technologies in my current role within my organisation.
10	I am confident that AI technology enhances my efficiency and boosts my learning or professional or research productivity.

Stakeholders' Expectations Concerning the Use of AI tools

1	I anticipate that the integration of AI tools will foster increased student engagement in the educational process.
2	I have high expectations that higher education institutions in Ukraine will adopt AI technologies to maintain their competitiveness.
3	I expect policymakers to play a pivotal role in advocating for the integration of AI tools in higher education institutions.
4	I have an expectation of receiving adequate support and training to effectively utilise AI tools in the educational (learning, professional) environment.
5	I anticipate that university labs will be equipped with the necessary devices and software to facilitate the use of AI technology for teaching purposes.
6	I expect that the use of AI tools will enhance students' competitive edge in the job market.
7	I expect that the university administration will provide support and encouragement for the integration of AI in course delivery.

Stakeholders' Concerns Regarding the Use of AI tools

1	I have concerns regarding the ethical implications associated with the utilisation of AI tools in the educational setting.
2	I have reservations about the extent to which AI tools can foster the development of critical thinking skills among students.
3	I am apprehensive about the potential replacement of human instructors by AI technologies in higher education and its impact on graduates' future employment prospects.
4	I am uncertain about whether universities in Ukraine possess the necessary resources to effectively implement AI technology for creating intelligent content and environments.
5	I have reservations about supporting any educational initiatives that rely on AI tools sponsored by universities in Ukraine.
6	I am unsure if students are sufficiently self-organised and prepared for self-directed learning using AI technology.
7	I am concerned that a lack of control over students' learning facilitated by AI tools may discourage their engagement and ultimately impact the quality of education.

Note: 1 - 'Strongly Disagree', 2 – 'Disagree', 3 - 'Neutral', 4 - 'Agree', and 5 - 'Strongly Agree'.

Appendix B. Focus Group Discussion Questionnaire

Relative Advantage:

1) In your opinion, what are the potential benefits of integrating AI tools in higher education institutions?
2) How do you think AI tools can improve teaching and learning experiences compared to traditional methods?
3) Can you share specific examples of how AI tools can enhance educational outcomes?

Compatibility:

4) How well do you think AI tools align with the current educational practices and strategies at higher education institutions in Ukraine?
5) What challenges or barriers do you foresee in integrating AI tools into the existing educational environment?

Complexity:

6) From your perspective, how challenging do you think it would be to implement AI tools in higher education institutions?
7) What kind of support and resources do you believe are necessary to facilitate the adoption of AI tools effectively?

Trialability:

8) Have you had any opportunities to try out or experiment with AI-powered educational tools or technologies? If yes, what was your experience like?
b) What factors could encourage or motivate stakeholders to test and explore AI tools before fully adopting them?

Observability:

9) How do you envision AI tools being used in the educational environment? Can you provide examples of observable changes they might bring to teaching and learning practices?
10) How can universities ensure that the benefits of AI tools are evident and visible to all stakeholders?

Implementation Challenges:

11) What potential challenges or concerns do you have regarding the widespread adoption of AI tools in the educational setting?
12) How can these challenges be addressed to ensure a smooth integration process?

Stakeholder Engagement:

13) In your opinion, how important is it to involve various stakeholders, such as students, faculty, administrators, and policymakers, in the decision-making process for AI integration?
14) How can different stakeholders actively contribute to the successful adoption of AI tools?

Recommendations:

15) Based on your knowledge and experience, what recommendations would you provide to higher education institutions in Ukraine to effectively integrate AI tools while addressing stakeholders' concerns and needs?