Artificial Intelligence Chatbots in Education: Academics Beliefs, Concerns and Pathways for Integration

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Abstract. Although globally there are mixed perceptions regarding the academic integrity of chatbots, existing research has mainly focused on developed nations, neglecting the unique perspectives of academics in developing countries, with different contextual, environmental, and technological settings. This study presents lecturers' perceptions of using Artificial Intelligence (AI) chatbots in education. Guided by the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), this research collected quantitative and qualitative data from 140 lecturers and three administrators from a STEM-based Zimbabwean university. The research confirmed that performance expectancy (belief in improved efficiency and personalised learning) and perceived value and social influence drive adoption. Contrary to previous studies, there was no significant link between effort expectancy (reduced workload) and chatbot use. Demographics like gender, age, and qualifications did not impact chatbot use. Academics were cautiously optimistic, recognising benefits like personalised learning and routine task management but concerned about ease of use, technical expertise, and ethical considerations. To effectively integrate AI chatbots into higher education processes, there is a need for funding, technical support, training, strengthening IT infrastructure and establishing frameworks for responsible use. Emphasising efficiency, personalisation, and robust support will help overcome barriers and maximise AI chatbots' potential in education.

Keywords: Artificial Intelligence; academics' perspectives; technology adoption; teaching and learning; higher education.

1. Introduction

AI chatbots have evolved significantly since their inception in the 1960s [1]. Despite AI's long history, recent advancements in supercomputing and big data technologies have accelerated its adoption, transforming various industries, including education [1]. The development of generative AI (GAI), particularly models like OpenAI's Generative Pre-trained Transformer (GPT), has revolutionised chatbots by enabling them to generate original content such as text, images and audio [2]. This capability has opened new possibilities for education, reshaping traditional teaching methods and enhancing learning experiences.

Notably, OpenAI, founded in 2015, introduced the first GPT model, which was trained on extensive textual data to generate human-like responses across different styles and domains [3]. Since then, AI chatbots have advanced significantly, with models like GPT -4, Gemini, and BigScience Bloom gaining traction in education. Their increasing usefulness has led to a 43% growth in 2022 as learning institutions and governments have increasingly expressed interest in their adoption [4].

Despite their rapid adoption, AI chatbots raise concerns about academic integrity, ethical use, and teaching practices [5][6]. Key challenges include data privacy, transparency and fairness, prompting some universities and governments to ban or regulate their use [4]. While research on AI chatbots in education is expanding, it remains predominantly student-focused and concentrated in developed countries such as Turkey, Sweden, Australia, and Canada, often overlooking educators' perspectives [5]. Most studies employ quantitative methods that fail to capture educators' experiences in assessment and pedagogy [4]. Consequently, there is a critical gap in understanding how AI chatbots impact higher education in low and middle-income countries (LMICs). Institutions in these regions face unique challenges in integrating AI technologies, necessitating tailored approaches [7]. This study seeks to bridge this gap by exploring the perspectives of academics on AI chatbot usage in teaching and learning at the National University of Science and Technology (NUST) in Zimbabwe. By examining their attitudes, concerns, and expectations, this research contributes to the global discourse on AI chatbot integration in higher education, ensuring that technological advancements align with the diverse realities of educational institutions worldwide. To cover this gap, the study aims to: identify the key factors that influence the adoption of AI chatbots in teaching; investigate academics' beliefs and attitudes toward AI chatbots; explore academics' perceived benefits and concerns regarding AI chatbots and recommend strategies for effectively integrating AI chatbots into teaching and learning.

2. Literature Review

AI Chatbots enhance teaching, learning, and administrative processes in higher education. They support personalised learning by analysing student data and delivering tailored content [8][9]. AI-driven adaptive instruction provides real-time feedback, adjusts learning paths, and accommodates diverse learning styles, improving engagement and performance [10]. Automated grading systems streamline assessments, offering instant, unbiased feedback while reducing educators' workload [15]. Virtual teaching assistants enhance learning by providing round-the-clock academic support, answering queries, and fostering collaboration, thereby improving accessibility and student success [11].

Multiple factors influence academics' willingness to adopt AI chatbots. One key driver is the perceived impact on teaching effectiveness, including personalised learning, timely feedback, and enhanced student engagement [12][8]. The likelihood of adoption also increases when AI chatbots feature user-friendly designs, which minimise complexity and encourage sustained use [12]. Social influence plays a significant role, with peer recommendations, institutional policies, and cultural acceptance shaping adoption decisions [12][13]. Additionally, institutional support such as investments in infrastructure and professional development facilitates successful integration [11]. Furthermore, favourable conditions, including reliable internet access and institutional commitments to AI, are crucial in determining educators' readiness to embrace these technologies [12] [14].

AI Chatbots enhance learning by personalising instruction, improving efficiency, and providing data-driven insights into student performance [11][22-24]. However, concerns persist regarding data privacy, algorithmic bias, transparency, and job displacement [15]. Ethical concerns also include AI's impact on pedagogy, equitable access, and accountability in decision-making [22]. Addressing these issues requires balanced implementation strategies to ensure responsible AI use in education.

Key challenges in AI Chatbot adoption include educator resistance driven by job security concerns and unfamiliarity with AI technologies [17]. Overcoming this requires professional development, clear communication of AI's benefits, and educator involvement in implementation decisions [11].Technological

infrastructure and reliable internet access are also critical for effective AI integration [2][8]. Institutions must invest in these areas while ensuring ethical AI deployment by safeguarding data privacy, mitigating algorithmic biases, and establishing regulatory frameworks [18].

Researchers have adopted various theoretical frameworks to understand chatbots in education, including Cognitive Flexibility Theory (CFT) [28], the Technology Acceptance Model (TAM) [10], the Diffusion of Innovation (DOI) theory [19], and the Self-Determination Theory (SDT) [32]. However, some studies lack a theoretical foundation. Each framework has limitations: CFT overlooks user willingness to adopt [28], TAM ignores social and situational factors[10], DOI focuses on overall diffusion rather than individual choices [19], and SDT neglects external influences [32]. This review highlights the need for more diverse and robust theoretical approaches to better understand AI chatbots' role in higher education.

3. Theoretical Framework

This study utilises the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model developed by [12] to examine factors influencing technology adoption. UTAUT2 shows that technology adoption is influenced by factors, such as performance expectancy (PE), effort expectancy (EE), enjoyment - hedonic motivation (HB), social influence (SI), cost-effectiveness - price value (PV), facilitating conditions (FC) and habitual use - Habit (HQ). These UTAUT2 constructs are relevant factors for consideration in the adoption of AI chatbots in education [13]. The established success of UTAUT2 in various studies further strengthens its credibility for research [20]. While other frameworks provide valuable insights, UTAUT2's comprehensiveness and emphasis on voluntary use make it a compelling choice for exploring AI chatbot adoption in educational contexts [21].

Based on the UTAUT2 model, the following hypotheses are formulated to test key factors influencing AI chatbot adoption among university academics:

H1: Performance expectancy (PE) positively influences AI chatbot adoption.
H2: Effort expectancy (EE) significantly affects AI chatbot adoption.
H3: Social influence (SI) impacts AI chatbot adoption.
H4: Perceived value (PV) is a strong predictor of chatbot usage in teaching and learning.
H5: Facilitating conditions (FC) positively influence AI chatbot adoption.
H6: Hedonic motivation (HB) positively influences AI chatbot adoption.
H7: Habit (HQ) significantly influences the frequency of AI chatbot usage.

4. Methodology

This study employed a mixed-methods approach using an explanatory sequential design to explore academics' perceptions of AI chatbot use in education. The study population comprised 529 academics, and a sample of 140 was randomly selected using the Raosoft calculator set at a 5% margin of error and a 90% confidence level to ensure statistical validity. Quantitative data were collected first through a structured questionnaire guided by the constructs of UTAUT2, for testing hypotheses about factors influencing AI chatbot adoption in education. This was followed by qualitative data collection through interviews with purposively sampled key informants to who included nine deans and the director of Institutional Research and Quality Assurance. Statistical Package for the Social Sciences (SPSS) version 26 software was used to perform descriptive statistics, correlation analysis, and multiple linear regression to illustrate key relationships between variables and test the hypothesis. The dependent variable is AI chatbot adoption, while the independent variables are PE, EE, SI, PV, FC, HB, and HQ, as outlined in the theoretical framework. Qualitative data, transcribed using Turboscribe software, underwent thematic analysis via NVivo version 14 software to identify key themes and patterns. The study enhanced reliability and validity through triangulation by integrating statistical and thematic findings, ensuring a comprehensive

understanding of academics' perceptions of AI chatbots in education. Ethical considerations were prioritised, with ethical clearance obtained from NUST's Institutional Review Board.

5. Results

5.1 Response Rate, Demographics, and AI Familiarity

The survey achieved a 77.78% response rate, surpassing the targeted threshold of 70%, indicating strong participant engagement and enhancing the generalisability of the findings[22] [23]. The interview response rate was lower at 33.3%. Despite this, data saturation was achieved, ensuring sufficient qualitative insights were gathered for a comprehensive analysis [22].The majority of respondents were male (57.9%) and aged 36-45 years (53.6%). A high level of familiarity with AI chatbots was observed, with 84.56% of participants indicating prior knowledge of the technology. Additionally, 95% of respondents held postgraduate degrees, including 53.6% with master's degrees and 41.4% with PhDs, reflecting the university's strong academic profile. All faculties were represented in the study, with the Commerce faculty having the highest participation (32.1%). Regarding AI technology usage in teaching, 41.43% of respondents reported using AI tools, while 58.57% had not yet adopted them. These findings highlight a well-informed academic population with varied perspectives on AI chatbot integration.

5.2 Key Factors Influencing the Adoption of AI Chatbots

The Pearson correlation analysis shows that coefficients reveal positive and negative correlations, offering valuable insights into the relationships between various factors, as presented in Table 1. PE is positively correlated with EE, SI, PV, and AU, indicating that higher expectations of chatbot performance led to higher perceived effort, SI, PV, and frequency of use. Similarly, EE is positively correlated with SI, HB, PV, and AU, suggesting that anticipated effort enhances SI, enjoyment, PV, and usage. SI also correlates positively with PV and AU, emphasising the role of peer opinions in chatbot adoption. HB shows positive correlations with PV and AU, indicating that enjoyment increases PV and usage. PV strongly correlates with AU, suggesting that users who find chatbots valuable use them more. Conversely, FC has a weak negative correlation with HB and AU, implying that easier-to-use chatbots may be less enjoyable and used less frequently. Overall, PE, SI, and PV emerge are the strongest adoption drivers.

Table 1. Analysis of Pearson Correlation Coefficients

		Correlations						
		PE	EE	SI	FC	HB	PV	AU
PE	Pearson Correlation	1	.484**	.095	-.055	.458**	.653**	.568**
	Sig. (2-tailed)		.000	.270	.522	.000	.000	.000
	N	137	137	137	137	135	135	137
EE	Pearson Correlation	.484**	1	.038	.138	.400**	.336**	.342**
	Sig. (2-tailed)	.000		.655	.103	.000	.000	.000
	N	137	140	140	140	138	138	140
SI	Pearson Correlation	.095	.038	1	.298**	-.105	.131	.268**
	Sig. (2-tailed)	.270	.655		.000	.218	.125	.001
	N	137	140	140	140	138	138	140
FC	Pearson Correlation	-.055	.138	.298**	1	-.222**	-.111	.007
	Sig. (2-tailed)	.522	.103	.000		.009	.195	.934
	N	137	140	140	140	138	138	140

		Correlations						
		PE	EE	SI	FC	HB	PV	AU
HB	Pearson Correlation	.458**	.400**	-.105	-.222**	1	.563**	.341**
	Sig. (2-tailed)	.000	.000	.218	.009		.000	.000
	N	135	138	138	138	138	138	138
PV	Pearson Correlation	.653**	.336**	.131	-.111	.563**	1	.593**
	Sig. (2-tailed)	.000	.000	.125	.195	.000		.000
	N	135	138	138	138	138	138	138
AU	Pearson Correlation	.568**	.342**	.268**	.007	.341**	.593**	1
	Sig. (2-tailed)	.000	.000	.001	.934	.000	.000	
	N	137	140	140	140	138	138	140

**. Correlation is significant at the 0.01 level (2-tailed).

To ascertain critical factors influencing AI chatbot adoption at NUST, a multiple linear regression model based on the UTAUT2 constructs was employed, and the results are presented in Table 2. The first model results reveal that PE, SI, PV, and HQ are the strongest predictors of adoption. PE (β= 0.263, p = 0.004) estimates that academics who expect chatbots to enhance learning are more likely to adopt them into their teaching activities. SI (β= 0.176, p= 0.002) predicts that peer influence significantly impacts adoption, with academics more likely to use chatbots if their colleagues also use the same. PV (β = 0.125, p =0.019) means that academics who perceive AI chatbots as valuable tools for improving student learning outcomes were more likely to use them. Lastly, HQ (β = 0.114, p = 0.023) suggests that people more accustomed to using AI chatbots tend to use them more frequently, meaning that habit drives more usage. Conversely, EE, FC, and HB were not statistically significant, indicating that they do not strongly impact adoption. A second model integrating demographic variables (Gender, Age, and Qualification) found that PE, SI, and PV remained significant, while all other constructs, including demographic characteristics, including demographics, had no substantial influence.

Table 2. Multiple Linear Regression Analysis

Coefficients[a]						
Model		**Unstandardised**	**Coefficients**	**Standardised Coeffs.**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	-.634	.482		-1.314	.191
	PE	.263	.091	.268	2.899	.004
	EE	.157	.144	.084	1.096	.275
	SI	.176	.056	.210	3.119	.002
	FC	-.013	.041	-.021	-.310	.757
	HB	-.071	.090	-.068	-.789	.431
	PV	.125	.053	.236	2.375	.019
	HQ.	.114	.050	.229	2.294	.023
2	(Constant)	-.408	.600		-.680	.498
	PE	.256	.091	.260	2.815	.006
	EE	.100	.151	.054	.662	.509
	SI	.167	.056	.199	2.955	.004
	FC	.008	.042	.013	.178	.859
	HB	-.015	.094	-.014	-.160	.873

Coefficients[a]					
Model	**Unstandardised**	**Coefficients**	**Standardised Coeffs.**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
PV	.125	.053	.236	2.385	.019
HQ.	.097	.050	.196	1.938	.055
Gender of respondents	-.071	.086	-.055	-.825	.411
Age of respondents	-.108	.065	-.132	-1.673	.097
Highest qualification obtained	.101	.085	.092	1.186	.238

a. Dependent Variable: AU

The above regression results reveal that some hypotheses are rejected while others are accepted, as shown in Table 3.

Table 3. Hypothesis Testing Summary Table

Hypothesis	Accept/Reject	Evidence
H1: PE positively influences adoption.	Accept	$\beta = 0.263$, $p = 0.004$ (Regression results)
H2: EE significantly affects adoption.	Reject	$p = 0.275$ (Not significant)
H3: SI impacts adoption.	Accept	$\beta = 0.176$, $p = 0.002$
H4: PV is a strong predictor.	Accept	$\beta = 0.125$, $p = 0.019$
H5: FC positively influence adoption.	Reject	$p = 0.757$ (Not significant)
H6: HB positively influences adoption.	Reject	$p = 0.431$ (Not significant)
H7: HQ significantly influences usage.	Accept	$\beta = 0.114$, $p = 0.023$

Table 4 summarises the multiple linear regression model.

Table 4. Model Summary of Multiple Linear Regression Analysis

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.708[a]	.501	.473	.46466	.501	18.206	7	127	.000
2	.719[b]	.517	.478	.46271	.016	1.359	3	124	.259

a. Predictors: (Constant), HQ, FC, SI, EE, HB, PE, PV

b. Predictors: (Constant), H.Q., FC, SI, EE, HB, PE, PV, Gender of respondents, Highest qualification obtained, Age of respondents

Model 1 explains 50.1% of the variance in AI chatbot adoption (R Square = 0.501), indicating a strong positive relationship between the predictors (PE, SI, PV, EE, FC, HB, and Habit) and adoption. The model's significance ($F = 18.206$, $p < 0.001$) confirms that these factors substantially enhance the explanatory power, confirming that these predictors significantly influence chatbot adoption. Model 2, which includes gender, age, and highest qualification, explains 51.7% of the variance ($R^2 = 0.517$), only slightly increasing from Model 1. The R^2 change (0.016) and F change (1.359, $p = 0.259$) indicate that

demographic variables do not significantly impact AI chatbot adoption. This suggests that adoption strategies should focus on user beliefs and attitudes rather than the demographic characteristics of users.

5.3 Beliefs and Attitudes of Academics about the Use of AI chatbots

The study further explored participants' beliefs and attitudes regarding AI chatbots in their teaching practices. The findings, which capture the range of sentiments expressed, are presented through the lens of the UTAUT2 constructs.

5.3.1 Performance Expectancy

Table 5 shows lecturer expectations regarding AI chatbots.

Table 5. Descriptive statistics PE

Performance Expectancy	Mean	Std. Deviation
AI chatbots can bring efficiency and productivity gains to a lecturer's teaching tasks and responsibilities (PE1)	3.72	.727
AI chatbots improve a lecturer's ability to provide personalized learning experiences for students (PE2)	3.63	.771
AI chatbots can enhance student engagement and motivation (PE3)	3.57	.698
AI chatbots can improve student's learning outcomes (PE4)	3.52	.742
AI chatbots can improve the quality and effectiveness of student feedback (PE5)	3.51	.711

Results indicate that lecturers believe AI chatbots can significantly improve efficiency, productivity, and personalised learning (mean scores of 3.72 and 3.63, respectively). The small standard deviations of 0.727 and 0.771 suggest a strong consensus among lecturers. These findings imply that lecturers view AI chatbots as valuable tools to enhance teaching effectiveness, reflecting positive beliefs and attitudes toward the technology.

5.3.2 Effort Expectancy

Table 6 shows the descriptive statistics of EE. The results indicate that respondents believe AI chatbots can significantly reduce workload and integrate easily into teaching (mean scores of 3.49 and 3.44, respectively). The standard deviations (0.963 and 0.850) suggest some variation in these perceptions, indicating that while there is a consensus on the benefits, individual differences exist in how easily academics perceive the integration process. This reflects varied beliefs and attitudes toward AI chatbots' ease of use and adaptability.

Table 6. Descriptive statistics EE

Effort expectancy	Mean	Std. Deviation
I perceive AI chatbots to significantly affect workload (EE1)	3.49	.963
I perceive it is easy would it be to learn how to use and integrate AI chatbots into my teaching (EE2)	3.44	.850
I perceive the ease of use of AI chatbots in the teaching and learning process (EE3)	3.25	.899
I believe using AI chatbots would necessitate changes to your teaching methods (EE4)	3.00	1.112

Effort expectancy	Mean	Std. Deviation
I am confident in effectively using AI chatbots as a teaching tool (EE5)	2.29	.890

5.3.3 Social Influence

Table 7 indicates that institutional policies and recommendations from other academics are the strongest influences on educators' decisions to adopt AI chatbots (mean scores of 4.29 for both). The relatively low standard deviations (0.844 and 0.852) suggest high consensus among academics. This implies that clear institutional policies and positive experiences shared by colleagues are crucial factors driving the adoption of AI chatbots in academic settings, emphasising the significant impact of social beliefs and attitudes.

Table 7. Descriptive Statistics SI

Social influence	Mean	Std.Deviation
Institutional policies and guidelines of AI chatbots are likely to influence your willingness to use these technologies in my courses. (SI1)	4.29	.844
I am likely to consider using AI chatbots in my teaching if I observed other academics using them (SI2)	4.29	.852
Educational events on AI chatbots are likely to influence my decision to use them in teaching (SI3)	4.27	.981
Students' preferences and feedback about AI chatbots is likely to influence my decision to incorporate them into teaching practices (SI4)	4.06	.954
A colleague's opinion about AI chatbots will likely affect my perception and use of AI chatbots (SI5)	3.80	1.230

Qualitative data further reveals that the most dominant view is colleagues' opinions on AI chatbots, showing a strong preference for increased integration. However, scepticism remains significant, likely due to concerns about reliability or job impact. Many colleagues have gained confidence in using AI chatbots, suggesting growing acceptance. The sharing of best practices is also emphasised, highlighting the importance of collaboration. While concerns exist, they are the least expressed opinion.

5.3.4 Facilitating Conditions: A Belief Barrier

The findings on technological resources needed for AI chatbot adoption at NUST reveal that the most crucial factors are AI infrastructure, training support, and internet connectivity. Among these, AI infrastructure appears to be the most pressing need for NUST. In line with the above sentiments, the key informant had this to say: *"Cloud computing infrastructure is essential for hosting and scaling chatbot applications and integration with existing learning management systems."* KI1.The need for specific technological resources might indicate that some lecturers believe that AI chatbots are currently impractical for integration into their teaching practices. Regarding training, one key informant had this to say:

"M*ore specialised support tailored to the needs of faculty members in different disciplines would be beneficial. Such as workshops, seminars, and one-on-one consultations to address specific challenges and questions related to chatbot implementation.*" KI1.Such sentiments highlight the importance of addressing these concerns to create a more belief-conducive environment for AI chatbot adoption.

5.3.5 Beliefs and Attitudes Influenced by Technical Support

Results indicate that a significant proportion of participants perceive insufficient technical support for AI adoption at NUST. Specifically, 34.38% of respondents believe there is insufficient support, while 18.75% report no technical support. Additionally, 31.25% of participants are unsure about the availability of support, highlighting uncertainty in the institution's capacity to assist with AI chatbot implementation. This widespread lack of confidence in technical support poses a potential barrier to adoption. Academics who perceive inadequate assistance may view AI chatbots as challenging to implement and maintain, reducing their willingness to integrate these technologies into teaching. Only a small proportion (9.38%) of respondents believe there is sufficient technical support, suggesting that institutional efforts to provide AI-related resources and guidance may need improvement.

5.3.6 Confidence in Institutional Support on AI Chatbot Adoption

There is significant uncertainty among academics regarding NUST's support for AI chatbot adoption. Approximately 37.5% of respondents reported being slightly confident, while 6.25% indicated not confident. Additionally, 34.38% remained neutral, emphasising the uncertainty surrounding institutional support. This lack of confidence may indicate scepticism about the university's commitment to integrating AI chatbots in teaching and learning. If lecturers perceive weak institutional backing, they may develop negative attitudes towards AI chatbot adoption, reducing their willingness to use them. Moreover, only a small fraction (6.25%) of respondents expressed confidence in receiving adequate support, reinforcing concerns that technical and administrative assistance may be lacking.

5.3.7 Hedonic Behaviour

Table 8 reveals a generally positive perception of AI chatbots among academics who use AI chatbots. Participants indicated enjoyment and emotional satisfaction from using AI chatbots in teaching activities. In line with this, one key informant said this: "*I believe using AI chatbots could be emotionally satisfying in teaching to a considerable extent*. "KI2

These results suggest that academics hold positive attitudes towards the hedonic aspects of AI chatbots, although some anxiety is also noted, reflecting mixed emotions.

Table 8. Descriptive statistics of HB of respondents

Hedonic behaviour	Mean	Std. Deviation
I enjoy using AI chatbots in teaching activities (HB1)	3.72	.819
I believe using AI chatbots can be emotionally satisfying in teaching activities (HB2)	3.41	.691
I feel anxious when I use AI chatbots in teaching activities (HB3)	3.21	.832

5.4.8 Habits of Usage of AI chatbots

The results show that 29.3% of participants occasionally use AI chatbots, while 22.1% use them frequently and 7.1% very frequently. Conversely, 27.9% have never used AI chatbots, and 13.6% rarely engage with them. These findings suggest that while some educators have integrated AI chatbots into their teaching practices, a significant portion remains hesitant or unaccustomed to using them regularly.

5.4.9 *Price value*

Table 9 shows that respondents view AI chatbots as a worthwhile investment (mean value of 3.62) and believe they can save time and effort compared to traditional methods (mean value of 3.45).

Table 9. Descriptive statistics of PV

Perceived value	Mean	Std. Deviation
I believe that investing in AI chatbots for teaching is justified based on their potential benefits and outcomes (PV1)	3.62	.994
I rate the overall value proposition of AI chatbots regarding their impact on student learning outcomes and engagement (PV4)	3.45	1.351
I think the time and effort saved by using AI chatbots in performing teaching tasks compared to manual methods is worth it (PV2)	3.39	1.401
I perceive the cost-effectiveness of using AI chatbots compared to traditional teaching methods (PV5)	3.33	1.269
It is important to consider the cost-benefit ratio of using AI chatbots in teaching compared to other investments or resources (PV3)	3.31	1.350

Qualitative findings reveal increased efficiency, long-term benefits, and ease of scaling up AI chatbots, although high startup costs are noted. These insights suggest that academics perceive significant value in AI chatbots, balancing cost concerns with anticipated benefits. Regarding this, one key informant had this to say: "*Chatbots can enhance teaching efficiency by automating repetitive tasks, providing personalised feedback to students, and facilitating self-paced learning"* KI2.

5.5 Perceived Benefits and Concerns about AI Chatbot Use in University Teaching and Learning

Study participants were asked about their perceived benefits of using AI chatbots in teaching and learning and their concerns about adopting AI chatbots in their daily teaching routine.

5.5.1 Benefits of AI Chatbots on Student Engagement

Results showed that AI chatbots significantly enhanced personalised learning and interaction among students. Furthermore, AI chatbots were viewed as benefiting student engagement by providing on-demand assistance, creating opportunities for interaction, and supporting immersive learning.

5.5.2 Concerns about using AI chatbots.

Study participants listed several concerns that could easily affect their adoption of AI chatbots if some are not controlled. Concerns raised included poor integration into teaching practices, ethical concerns, potential biases, technical barriers, limited development of critical thinking skills in students, plagiarism risks, and learner resistance. The most significant challenge appears to be poor integration, likely due to a lack of resources and technical expertise among educators regarding AI chatbot use.

5.6 Strategies for effectively Integrating AI Chatbots into Teaching and Learning (Recommendations)

Participant also suggested a range of strategies to overcome barriers to AI chatbot adoption in teaching. These strategies include increased ICT support services, identifying development partners, allocating more resources for AI chatbots, implementing training and development campaigns, improving internet access and speed, and launching staff engagement and awareness campaigns on AI chatbots. By implementing these strategies collectively, institutions can aim to mitigate obstacles and enhance the quality and efficiency of educational processes by integrating innovative technology. Support strategies for integrating AI chatbots into teaching practices were highlighted as: Strengthening the IT department's capacity, organising workshops on using AI chatbots, providing technical resources to lecturers, developing guidelines and support materials, and increasing faculty awareness of AI chatbots as a teaching tool. In line with this, one key informant had to say: **"***NUST can better support faculty members by providing comprehensive training and professional development opportunities tailored to educators' specific needs*

and interests. This could include workshops, seminars, and online resources focused on the practical applications of AI chatbots in teaching and learning, and hands-on training sessions to help educators develop the skills needed to integrate chatbots into their courses effectively." KI1.
By implementing these strategies, NUST can provide comprehensive support to faculty members as they integrate AI chatbots into their teaching.

6. Discussion

6.1 Key factors that influence the adoption of AI chatbots in teaching.
This study identified factors influencing academics' use of AI chatbots in teaching. Like past research [12], academics who believe chatbots improve efficiency and personalised learning (PE) are more likely to use them. These chatbots can be virtual assistants and personalise learning experiences [24]. PV (usefulness) and SI (peers' opinions) also positively impact adoption [25].Interestingly, this study found no link between EE (reduced workload) and chatbot use, contradicting prior research [2]. This suggests that factors beyond workload may influence adoption, particularly in programming courses. Finally, the study found that lecturers' gender, age, and highest qualification did not significantly impact their use of AI chatbots.

6.2 Beliefs and Attitudes of academics about AI chatbots in teaching and learning.
This study finds academics cautiously optimistic about AI chatbots. They see potential benefits like efficiency and personalised learning but worry about ease of use. To bridge this gap, universities can offer training and support and showcase successful chatbot use. This aligns with prior research on the perceived benefits of AI in education [26]. However, some tasks may be better suited for automation than others [27]. User-friendliness might also vary by age and technical skills [10]. The study also found that academics enjoyed using AI chatbots, which aligns with research suggesting that positive user experiences lead to more positive beliefs about AI [8]. This suggests that hands-on experience can be a powerful driver of adoption. Overall, while challenges exist, AI chatbots hold promise for education. Addressing ease-of-use concerns and fostering positive experiences are essential to successful integration.

6.3 Perceived benefits and concerns of using AI chatbots in teaching and learning.
This research confirms AI chatbots as valuable tools for personalised learning, aligning with Orland-barak and Wang [28]on the benefits of personalised feedback. Chatbots can provide immediate explanations and manage routine tasks, freeing up academics for deeper interactions [16], [18]. Additionally, they cater to diverse learning styles and promote accessibility [1].However, concerns exist regarding integration challenges due to limited technical expertise and resources among academics [17]. The complexity of learning and using chatbots and the initial time investment required further discourage adoption [29]. Disruption of established teaching methods can also be a barrier [27]. These findings align with previous research highlighting challenges like ethical concerns [16] and the importance of human-centred design [9] for successful integration. The rapid pace of development underscores the need to address these challenges for effective implementation.

6.4 Strategies for effectively Integrating AI Chatbots into Teaching and Learning
This research aligns with existing literature on overcoming barriers to AI chatbot adoption in universities. Similar to prior studies [4], this research suggests increased funding, technical support, and collaboration are crucial for successful integration (e.g., strengthening IT departments' workshops for faculty). This consistency highlights potential resource limitations, particularly in developing countries [30]. Furthermore, the study reinforces the importance of faculty support strategies identified by Klayklung [2], such as hands-on workshops, technical resources, and clear guidelines. These elements can address challenges arising from technical incompatibilities and faculty's lack of technical expertise. Finally, successful AI chatbot integration at NUST aligns with previous research by Jiang[31] and Maphosa and

Maphosa [4] on the importance of AI infrastructure. Additionally, a study by Orland-barak and Wang [28] emphasises the value of training programs and support networks, respectively. This consistency suggests that universities face similar challenges when adopting new educational technologies.

7. Limitations

This study focused on a single university (NUST), limiting its generalizability to other institutions, especially in low- and middle-income countries. It only considered faculty perspectives, excluding students, parents, and industry partners. Finally, with no current AI chatbot policy at NUST, the study could not assess long-term impacts. Despite these limitations, the research provides valuable insights and recommendations for future exploration of AI chatbots in higher education, particularly in low- and middle-income countries.

8. Recommendations for future research

This study focused on academics' perspectives. Future studies could explore both academics' and students' perspectives to build a holistic AI framework. Furthermore, there is a need to build upon cybersecurity and awareness frameworks such as the one developed by Mutunhu [32] for a similar university to promote responsible AI use. Additionally, longitudinal studies tracking the long-term impact of AI chatbots on teaching and learning would be valuable, focusing on privacy awareness, as Maguraushe [33] notes that these remain scholarly discourses in education. Future research could investigate the technical aspects of AI chatbot development, including programming languages, frameworks, and algorithms, to enhance functionality and integration. Comparative studies are also recommended to assess the effectiveness of different AI chatbot platforms and explore user experience and interface design in diverse educational settings and cultural contexts. These investigations would help identify specific challenges and opportunities, leading to more practical implementations across various educational environments.

9. Conclusion

This research explored the influence of AI chatbots in teaching and learning, particularly at NUST. AI chatbots promise to improve educational experiences as academic reports increase efficiency, personalisation, and teaching effectiveness. Institutional support through policies and peer encouragement is crucial for adoption while overcoming challenges like technical limitations and ethical concerns is necessary. NUST can benefit by strengthening IT infrastructure, providing training programs, and fostering a supportive environment for faculty using AI chatbots. The research also found that academics experience greater enjoyment and satisfaction with AI chatbots, likely due to increased efficiency and productivity gains. To effectively integrate AI chatbots, institutions should implement comprehensive support strategies, strengthen IT infrastructure, and provide faculty training and resources. By addressing these considerations, educational institutions can harness the potential of AI chatbots to create a more engaging, efficient, and effective learning environment.

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