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Exploring the Transformative Effects of Artificial Intelligence and its Impact on Educational Practices

Rukudzo Ndlovu, Kghanya Ndlovu, Samson Chivunga, Lawrence Mkwebu, Belinda Ndlovu and Sibusisiwe Dube
Master of Science Information Systems
National University of Science and Technology, Bulawayo, Zimbabwe
P.O Box AC939, Ascot, Bulawayo, Zimbabwe
N0231755E@students.nust.ac.zw, N0236597F@students.nust.ac.zw
,N0236676X@students.nust.ac.zw ,N0238692H@students.nust.ac.zw,
belinda.ndlovu@nust.ac.zw ,sibusisiwe.dube@nust.ac.zw

Abstract

The following study discusses the transformative effects of artificial technology (AI) and its impact on educational practice. The study zeros in on the ChatGPT launched on the 30th of November 2022. As the drive to achieve the 4th structural development goal (SDG 4), which is striving towards equitable quality education and promoting a lifetime of learning opportunities for learners, AI can exponentially increase the chances of attaining this goal. This is because it transcends international boundaries which would ensure that marginalized communities have access to its personalized learning capabilities. Despite the many potential benefits of AI, it is still in its infancy stage of adoption within the educational sector due to limited information on how to effectively adopt it. This paper aims to develop a conceptual framework for the considerations on the adoption of artificial AI in education. The paper adheres to the PRISMA Protocol. The databases that were searched are ACM and Google Scholar, ultimately the total number of studies that met the final inclusion criteria after screening was 14. The findings reveal that some of the critical factors that influence the adoption of ChatGPT are skills and workforce readiness, cultural acceptance, and change management. Opportunities derived include enabling personalised learning, enhanced teaching practices, and engaged and effective learning. Most barriers identified by the study were academic dishonesty, misuse by educators and learners, and limited language options. Furthermore, the application areas outlined by most authors are higher education and popular science education. The study is geared at contributing to the pool of knowledge by providing a holistic view of AI and considerations to be made when trying to adopt it. This has been achieved by the creation of a framework to that effect. This review offers areas of consideration for researchers, policymakers, and stakeholders in education to maximize the revolutionary power of AI to reshape the educational landscape and improve learning outcomes for all students.

Keywords
Artificial Intelligence (AI), Higher Education, OpenAI, ChatGPT, Education, Tertiary Education.

1. Introduction

Artificial Intelligence (AI) is a facet of computer science that makes computers mimic the behavior of humans to improve human performance in science and technology (Ghosh and Thirugnanam 2023). AI is a cutting-edge technology that impacts almost every field, business, defence, aerospace, or healthcare system. Existing reviews such as Dube et al (2024) highlighted that some of the benefits included learning support and concept simplification, but their study had the following limitations, the paper was a rapid systematic literature review, meaning it was carried out quickly and there is a chance that more and different themes could emerge from the literature. Holmes and Toumi (2024) have alluded, that AI can personalize learning experiences, provide real-time feedback, and automate routine

tasks, allowing educators to focus on more critical tasks. Similarly, AI can improve student outcomes by providing students with targeted support and interventions. In their study, they also highlight that the future of education is unpredictable and as technology matures more studies will be needed. According to a report from UNESCO (2023), the lack of national on generative AI in many nations raises data privacy issues for users and opens a gap for educational institutions as they may be largely unprepared to validate the tools which in turn becomes a barrier to the successful implementation of ChatGPT in the educational sector. Lo (2023) submits that while AI offers substantial benefits, there are many challenges that it brings such as AI-assisted cheating, concurrently the review may have been limited by the researcher making propositions based on their intuition rather than employing empirical evidence. It is therefore the duty of all interested parties, i.e., governments, regulators, civil society organizations, individual users, and AI innovators to guarantee the responsible use of AI as it is a multifaceted challenge. Grassini (2023) states that there still exists a gap concerning national regulations and guidelines on what should be considered fair usage. Ultimately the drawback that this paper seeks to address is the limited knowledge amongst institutions surrounding the considerations to be made before the adoption of ChatGPT as a learning tool.

Research questions

1. What are the factors that influence the adoption of AI in education practices?
2. What opportunities exist to ensure AI is leveraged within the education sector?
3. What challenges exist in the current education system hindering the adoption of AI?
4. What are the application areas for ChatGPT in the Educational domain?

The study consists of 5 sections, section 1 is the introduction, section 2 covers the methodology, section 3 contains the results, section 4 is the discussion and the final section covers the implications.

2. Methodology

This study adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al 2009). Following the PRISMA protocol in conducting the study ensured transparency and reproducibility in the search and selection process.

Identification

For the identification stage, a comprehensive search was conducted across two academic databases: Google Scholar and ACM. The search string used in the database search was (("artificial intelligence" OR "AI") AND ("Higher Education" OR "tertiary education ") AND ("chatGPT*")). The inclusion parameters for the study consisted of studies published from November 2022 to the present, studies written in English, industry reports examining the usage of ChatGPT, peer-reviewed journals, and conference proceedings. Studies that were excluded included case studies and studies not focused on AI in education. The screening process involved carefully reviewing the titles and abstracts of the identified studies to assess their relevance to the research question and adherence to the inclusion

Eligibility and screening

An evaluation of the articles' suitability according to the inclusion and exclusion criteria yielded a total of 121 articles with Google Scholar 27 studies and ACM 94 studies. In the 1st stage n=65 records were removed by automation tools for various reasons, the remaining n=56 studies underwent title and abstract screening. During this stage, n=20 studies were excluded based on the pre-defined inclusion and exclusion criteria, leaving n=36 studies for full-text review. The full-text assessment led to the further exclusion of n=22 studies that did not meet the eligibility criteria, primarily due to a lack of focus on the educational applications of ChatGPT or other AI technologies. Ultimately, a total of n=14 studies were included in the final synthesis.

3. Results

Depicts the various stages of the study selection process is presented in Figure 1 and papers included in the review is presented in Table 1.

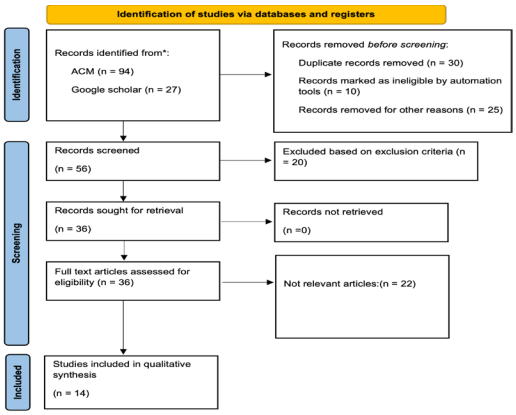

Figure 1 depicts the various stages of the study selection process.

Table 1. The 14 Papers included in the review

ID	Author	Country	Method	Theoretical Framework	Factors	Opportunities	Challenges	Application area
1	Adiguzel et al (2023)	Turkey	Qualitative		-Ethical and Legal Considerations	-Personalized learning -improve teaching skills	-ethical concerns -privacy issues -reliability and accuracy	-Practical Skills Learning
2	Atlas (2023)	USA	Mixed		-Skills and Workforce Readiness -Data Availability and Quality	-Brainstorming ideas -Personalized learning -Language translation	-ethical concerns	-Higher Education -Popular Science Education
3	Biswas (2023)	United Kingdom	Mixed		-Ethical and Legal Considerations -Trust and Explainability	-Personalized learning experiences -immediate feedback -language support	-ethical concerns -reliability and accuracy -unexpected results	-Higher Education
4	Freeman et al (2023)	Japan	Qualitative		Ethical and Legal Considerations	-adaptive assessments -personalized learning -improve educational outcomes	-ethical concerns	-Higher Education -Practical Skills Learning
5	Chinonso et al (2023)	Nigeria	Qualitative		Ethical and Legal Considerations	-immediate feedback -Personalized learning experiences	-reliability and accuracy -ethical concerns	-Higher Education

6	Debajyoti (2023)	Thailand	Qualitative	PTM	Industry and Domain-specific Challenges	-content creation	-potential impact on traditional assignments	-Higher Education -General Learning Domain -Popular Science Education
7	Frankford (2024)	Portugal	Mixed Methods		-Cultural Acceptance and Change Management -Industry and Domain-specific Challenges	-timely feedback -scalability	-generic responses -Over-reliance on AI	-Higher Education -Popular Science Education
8	Fuchs K (2023)	Thailand	Qualitative		-Ethical and Legal Considerations -Industry and Domain-specific Challenges	-Personalized learning -immediate feedback	-Decreasing critical thinking - ethical concerns	-Higher Education -Popular Science Education
9	Mai et al (2024)	Vietnam	Mixed		-Trust and Explainability -Industry and Domain-specific Challenges	-Personalized learning -immediate feedback	-reliability and accuracy -ethical concerns -Decreasing critical thinking	-Higher Education -Popular Science Education
10	Saiu Hoi et al (2023)	China	Quantitative	TAM	- Industry and Domain-specific Challenges	-Personalized learning experiences	-Limited to text	-Higher Education -Popular Science Education
11	Sok and Heng (2023)	Cambodia	Qualitative		-Trust and Explainability -Ethical and Legal Considerations -Cultural Acceptance and Change Management	-Personalized learning -immediate feedback -Personalized learning -Brainstorming ideas	-Academic integrity issues -reliability and accuracy -Over-reliance on AI	-Higher Education
12	Trust et al (2023)	USA	Qualitative		-Ethical and Legal Considerations	-Offer suggestions for improving teaching -Provide support with teaching -Personalized learning	-ethical concerns	-Higher Educations -Practical Skills Learning
13	Willems (2023)	Austria	Qualitative		-Ethical and Legal Considerations -Trust and Explainability	-text generation -resource finding -exploring examples in academic research.	-ethical concerns -reliability and accuracy	-Higher Education -General Learning Domain

14	Zhai (2023)	USA	Qualitative		-Ethical and Legal Considerations -Trust and Explainability	-Personalized learning experiences -Creating learning assessment	-ethical concerns -reliability and accuracy	-Higher Education -General Learning Domain

3.1 Number of Publications by Year

From the above table, the majority of the sources n = 12 were published in 2023 . 2 sources were published in 2024, and 0 studies were identified from 2022 which is the year ChatGPT was released (30 November 2022). The increased interest in the technology was because it was not only accessible but also highly (Figure 2) sophisticated (Lo 2023). ChatGPT gained considerable attention and generated debate resulting in relatively more research on the technology. According to Freeman and Aoki (2023), while the overall number of articles about AI in education was growing, the articles that directly addressed the use of ChatGPT for educational purposes appeared most recently, suggesting that the tool's release is causally linked to the increase in articles.

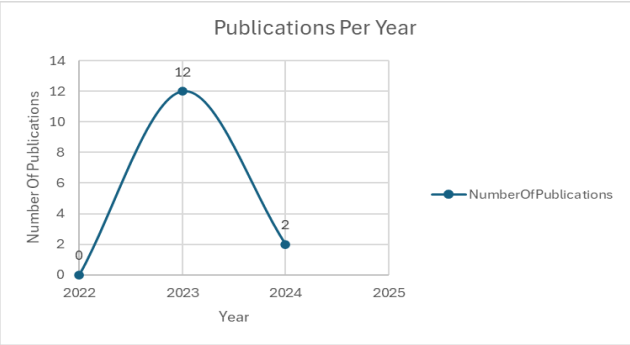

Figure 2. Analysis of publications by year of publication

3.2 Publications Per Continent

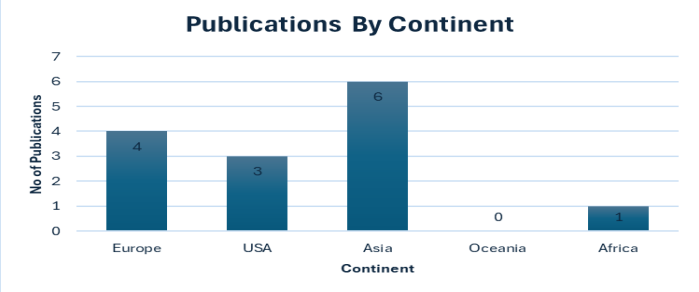

Figure 3. Graphical Presentation of Publications Per Continent.

The study yielded n =6 studies from Asia, n = 4 from Europe, n = 3 studies from the USA, n = 1 study from Africa, and n = 0 studies from Oceania (Figure 3). The high prevalence of studies originating from Asia may be attributed to an extensive acceptance of the technology in the region which has piqued the interest of researchers in that domain. (Rueda et al 2023)

3.3 Method Trend Analysis

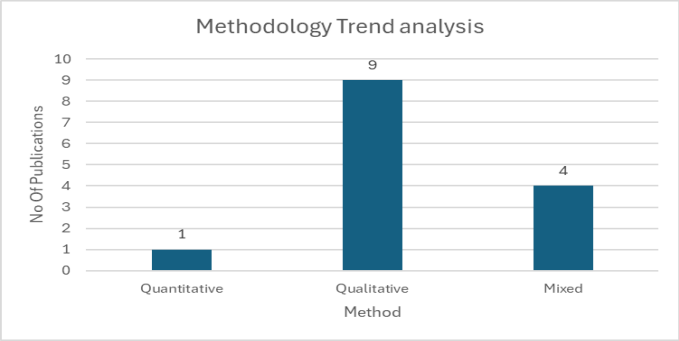

Figure 4. Graphical representation of research methods.

Out of a total of 14 studies, n = 9 studies employed a qualitative research method, n = 4 studies had mixed methods and there was only one, n = 1 study that employed the quantitative method (Figure 4). The high prevalence of studies conducted using qualitative methods may be indicative of researchers placing a high priority on in-depth exploration to identify underlying themes that may not be quantified (Crotty 1998).

3.4 Factors, Opportunities, Challenges, and Application of ChatGPT in Education

Themes Identified categorised by research theme is presented in Table 2.

Table 2. Themes Identified categorised by research theme.

Main Theme	Sub-Theme	Frequency	Source ID
Factors	Ethical and legal considerations	9	1; 3; 4; 5; 8; 11; 12; 13; 14
	Trust and explainability	5	3; 9; 11; 13; 14
	Industry and Domain specific challenges	5	6; 7; 8; 9; 10
	Cultural acceptance and change management	2	11; 7
	Skills and workforce readiness	1	2
	Data Availability and Quality	1	2
Opportunities	Personalisation	11	1; 2; 3; 4; 5; 8; 9; 10; 11; 12; 14
	Immediate feedback	7	3; 5; 7; 8;9; 11; 12
	Language and Support	1	2
	Streamling teaching tasks	3	6; 11; 12
	Providing scalable solutions	1	7
	Fostering creativity and idea generation	2	2; 11
	Facilitating exploration and resource access	1	13
Challenges	Ethical concerns	10	1; 2; 3; 4; 5; 8; 9; 12; 13; 14
	Academic Integrity Issues	1	11
	Impact on critical thinking	2	8; 9
	Reliability and Acuracy	7	1; 3; 5; 9; 11; 13; 14
	Unexpected results	1	3
	Generic responses	1	7
	Over-reliance on AI	2	11; 7
	Limited to text	1	10
	Privacy Issues	1	1
Application Areas	Higher Education	14	1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11;12; 13; 14
	Practical Skills Education	3	1; 4; 12
	General Learning Domain	3	6; 13; 14
	Popular Science Education	6	6; 7; 8; 9; 10; 1

3.5 Classification by Theoretical Framework

Out of a total of 14 studies n = 1 studies employed the TAM model, n = 1 used the Psycho technical model (PTM), and for n = 12 studies, the theoretical model wasn't specified (Figure 5). The reason behind the identified phenomenon may be that in the early stages of the launch of a disruptive technology, researchers may prioritize explorative research,

case studies, and more in-depth research to gain a deeper understanding of the practical implications of the said technology (Chauke and Methi 2024)

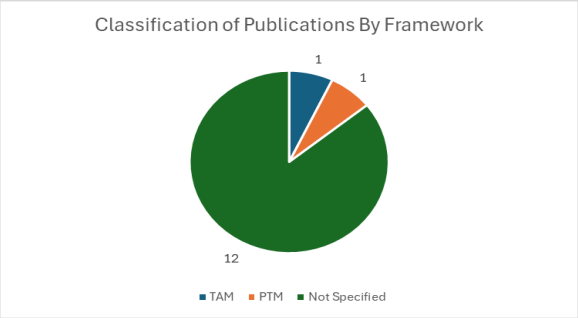

Figure 5. Pie Chart representing the frameworks employed.

4. Discussion

This systematic literature review examined the transformative effects of ChatGPT on educational practices. The review considered studies from diverse countries employing various methodologies. It focused on several key areas, including opportunities and challenges associated with ChatGPT in education, application areas, factors influencing AI adoption, and frameworks.

4.1 Factors Affecting the Adoption of ChatGPT in Education

Six factors affect the adoption of ChatGPT in education and these are ethical considerations, trust, industry-specific challenges, skills readiness, cultural acceptance, data availability, and quality. Ethical and legal considerations were frequently cited by (Freeman et al.2023, Chinonso et al. 2023, and Fuchs 2023) and the majority of papers as a key factor influencing AI adoption in education. ethical considerations refer to the critical examination of the moral, social, and legal implications related to the integration and application of AI technologies in educational contexts. (Zhai 2023). Willems (2023) states that establishing ethical guidelines and addressing legal implications is crucial for successful implementation. Sok and Heng (2023); Mai et al (2024); Biswas (2023) state that trust and explainability play a significant role in the adoption of chatGPT.Mai et al (2024) define trust in AI as the confidence and reliance that individuals or stakeholders place in the abilities, reliability, and ethical behavior of artificial intelligence systems. Industry-specific challenges in chatGPT adoption were identified as a prominent factor by (Bassner et al 2024, Fuchs 2023, and Mai et al 2024). It refers to the unique obstacles and issues faced when implementing and integrating AI technologies in educational settings (Saiu Hoi et al 2023). These issues come as a result of the education industry's unique traits, requirements, and complexities. Debajyoti (2023); Bassner et al (2024); and Fuchs (2023) state that industry and domain-specific challenges play a significant role as well, requiring tailored approaches for different educational contexts. Mai et al (2024) on the other hand refer to them as the unique obstacles and issues faced within a particular industry or specific domain of knowledge. These challenges arise due to the distinct characteristics, requirements, and complexities associated with that industry or domain (Saiu Hoi et al 2023). Cultural acceptance and change management also emerged as factors although less frequently than those stated above, Frankford et al (2024) highlight the need to address potential resistance and ensure smooth integration within existing educational cultures. Other factors included data availability and data quality. Atlas (2023) states that data availability and data quality-specific challenges in chatGPT adoption in education refer to the obstacles and issues related to the accessibility and reliability of data used in educational AI systems. Such challenges emerge because educational data is characterised by certain qualities and is inherently complex.

4.2 Theoretical Frameworks Used to Explain the Adoption of ChatGPT in Education

The papers reviewed offered little information as to the particular frameworks employed in the studies of AI education. Saiu Hoi et al (2023) refer to the need for frameworks concerning the introduction of ChatGPT in Higher education. Two specific frameworks are mentioned: the Psycho technical model (PTM) and the technology acceptance model

(TAM). To have a better understanding of the use of ChatGPT, Pal and Debajyoti (2023) adopted a psycho-technical model by integrating the technical dimensions with contextual factors such as perceived humanness; novelty; and personality. This approach derives from the shortcomings of the technical models like the TAM & in understanding the adoption of AI technologies with human-like interfaces such as ChatGPT. While (PTM) recognizes technological factors, it extends them with contextual factors such as perceived humanness and novelty value, which are most applicable in the case of AI applications such as ChatGPT (Debajyoti Pal 2023). Although the TAM has been extensively used in different domains such as information systems research, human-computer interaction, and technology adoption. Saiu Hoi et al (2023) note that it offers a theoretical framework for explaining users' acceptance and usage behavior concerning new technologies as well as assisting in the formulation of strategies for implementing technology solutions that would increase user acceptance and utilisation of new technologies. More studies are required for a more comprehensive framework concerning AI use in education.

4.3 Opportunities Derived from Using ChatGPT in Education

Seven opportunities for ChatGPT in Education were uncovered. Mutunhu et al (2022); Dube et al (2023) highlighted, that the sudden shift to full-time online learning during the COVID-19 pandemic posed significant challenges for both students and lecturers. The abrupt transition away from traditional face-to-face instruction necessitated rapid adaptation of the teaching and learning methods of Dube et al (2023). In the event of a future pandemic disrupting in-person education, the integration of AI technologies can offer personalised learning, and immediate feedback, streamline teaching tasks, brainstorm, enhance teaching practices, offer scalable solutions, and foster exploration. Personalised learning experiences emerged as a significant opportunity across the majority of the papers reviewed including (Adiguzel et al 2023, Atlas 2023, and Biswas 2023). They also demonstrate how, with the help of ChatGPT, educational material, their delivery, and assessments can be personalized to the student. ChatGPT can further enhance the educational sector by analysing a student's academic performance and personality type from recommendation systems such as (Ndlovu et al 2023). Based on this personalised learning paths and educational resources that cater to the students' strengths, weaknesses, and learning styles can be availed. Immediate feedback also emerged as a key opportunity with a large number of papers highlighting it. It enables students to receive real-time insights into their performance as stated by (Biswas 2023, Chinonso et al 2023, and Frankford, et al 2024). Chinonso et al (2023) refer to the capability of artificial intelligence systems to provide timely and personalised feedback to learners. It enables learners to receive instant responses, assessments, and guidance on their learning. While Trust et al (2023) define streamlining teaching tasks as the process of optimising and simplifying various administrative, instructional, and organisational responsibilities of educators. Sok and Heng (2023) state it involves leveraging technology, automation, and efficient strategies to reduce the time and effort required for routine tasks, allowing teachers to focus more on high-value activities that directly impact student learning. Other opportunities identified included, brainstorming, enhanced teaching practices, scalable solutions, and fostering exploration.

4.4 Challenges associated with the use of ChatGPT in education

The results of the systematic review also revealed challenges for ChatGPT in Education. These are ethical considerations, impact on critical thinking, reliability concerns, unexpected results, overreliance on chatGPT, privacy issues, limited to text, generic responses, and academic integrity issues. The most frequently mentioned challenges are ethical concerns and reliability concerns. Ethical concerns consistently arose as a major challenge across the following papers (Adiguzel et al2023, Atlas 2023, Biswas 2023, Freeman et al 2023) and others. Such issues include data protection, algorithmic bias and – the effective implementation of AI in learning institutions. (Adiguzel et al 2023, Biswas 2023, Chinonso et al 2023) and others found that the dependability and precision of ChatGPT are another common concern. Ensuring that AI tools provide accurate information and consistent results is crucial for their effective integration into education (Zhai 2023). Other challenges highlighted include over-reliance on ChatGPT. Frankford (2024) states that over-reliance on ChatGPT, or any AI language model, can lead to various concerns and limitations. (Fuchs 2023, Mai et al 2024, and Trust et al 2023) raise concern that the use of AI may hamper the growth of the student's problem-solving skills. Even though applications such as ChatGPT are beneficial in terms of help and information. it's important to understand their limitations and consider them within the context of their use (Sok and Heng 2023). Academic integrity issues are a prevalent challenge as well. Sok and Heng (2023) refer to academic integrity as the ethical principles and values that underpin honest and responsible academic behavior, and - the potential for decreasing critical thinking.

4.5 Application areas of ChatGPT in education

The analysis carried out on the different categories of applications suggested four application areas of ChatGPT in Education namely higher education, practical skills education, general learning domain, and popular science learning.

Higher Education and popular science education emerged as the most prominent areas of AI application. (Sok and Heng 2023, Willems 2023, Frankford et al 2024) Identifying the use of artificial intelligence in higher learning institutions offers numerous application areas that can enhance teaching, learning, administrative processes, and overall student experience. While (Saiu Hoi et al 2023, and Mai et al 2024) state that AI adoption has a large number of application areas in the sphere of popular science in education., which aims to make scientific concepts and knowledge accessible and engaging to a wide audience. Some key application areas of AI in popular science education are interactive learning experiences, intelligent content recommendation and gamification, and interactive simulations (Frankford 2024). This implies a trend towards the use of AI in improving the teaching and learning processes of university education. Trust et al (2023) describe it in the context of application in practical Skills learning and Zhai (2023) in learning Domains in general.

5. Implications

With the help of such AI tools as ChatGPT, education can improve students' participation, motivation, and self-organisation in learning. Biswas (2023) states that by providing personalized feedback, adaptive learning experiences, and intelligent guidance, these tools can give the students control over their learning process, enhance their learning experience, keep them motivated, and develop the necessary skills for lifelong learning. However, it is important to consider ethical considerations, data privacy, and the need for human support and guidance alongside the integration of AI into educational practices to ensure a balanced and effective learning environment.

5.1 Practical Implications

There was a low number of studies focusing on the African continent. ChatGPT, an AI model can help transform education in Africa in several ways. One of the significant problems that require a solution in Africa is the access and quality of education among the disadvantaged groups of the population or regions such as rural ones. With the help of ChatGPT, students can get the necessary educational materials and attend classes remotely irrespective of their location. Through AI, students shall be able to get learning materials, make inquiries, and get instant responses, thus overcoming geographical barriers in regions with poor education facilities and resources (Atlas 2023). Ethical issues include the issue of the digital divide, which focuses on ensuring that all people have an equal opportunity to access AI technology assets and preventing the marginalization of disadvantaged students or communities (Mai et al 2024). As such, to effectively implement ChatGPT in education in Africa, the following factors and challenges have to be put into consideration. An Internet connection that is both reliable and fast is required for the use of ChatGPT in education. In this regard, it is important to focus on the development of Internet networks, especially in rural and other unserved regions. In addition, attempts should be made to make devices like computers or smartphones in use in teaching and learning affordable to students and teachers. There should be proper digital literacy programs that should be offered so that students, teachers, and administrators can be equipped with the right knowledge on how to use ChatGPT and other AI applications. For the programs to encourage the use of AI in training teachers, the programs should focus on how the use of AI can be incorporated into teaching, the use of ChatGPT in teaching and learning as well as in assessment and support of learners (Sok and Heng 2023).

5.2 Proposed conceptual framework

This proposed framework provides the chance for the investigation of new factors that cannot be investigated in the frameworks mentioned above. Given that the integration of ChatGPT in education is still a novel idea, certain aspects and issues are not captured by TAM. Since TAM mainly relies on the perceived intention to use technology as the key driver of actual technology use, Saiu Hoi et al (2023). But the intention does not guarantee that the technology will be used and other factors like external pressures and availability of other options may affect the adoption decision. As a result, TAM mainly concentrates on individual characteristics and does not take into account other external or organizational factors that might affect the technology acceptance. It may not capture all the social, cultural, or institutional factors that may affect the acceptance of technology. In the context of (the PTM) framework, Debajyoti (2023) focuses mainly on the benefits of ChatGPT and fails to address the emerging negative impacts of its application. Therefore, we propose a more holistic approach that focuses on the ethical issues, concerns, and negative implications of ChatGPT including privacy violations and security concerns (Figure 6).

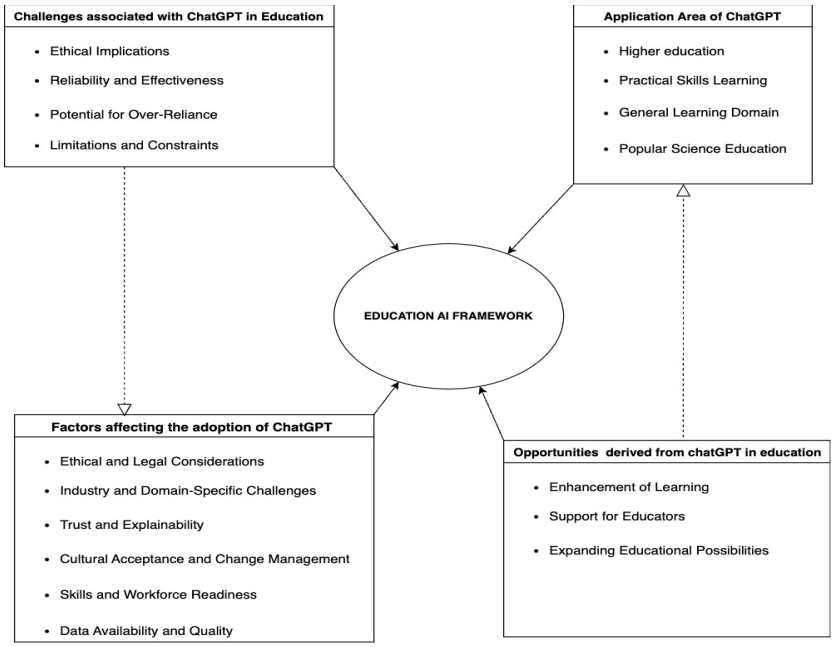

Figure 6**.** Conceptual Framework: A holistic approach to the adoption of ChatGPT in Education

Thus, using a more comprehensive approach, it is possible to explore these new factors and enhance the knowledge of ChatGPT adoption in higher education. Hence the proposed framework encompasses four main areas: benefits, risks, domains, use, and the factors influencing the use of the technology. These dimensions help to provide a broader view of the use of ChatGPT in higher learning institutions, by taking into account several factors of the research area. The proposed framework is also scalable and expandable by the inclusion of new dimensions, variables, or sub-components that may be important in the case of ChatGPT in the context of higher learning institutions. This adaptability ensures the framework remains up-to-date and applicable to the evolving research landscape. When selecting a framework, it is crucial to assess its suitability concerning the research objectives, context, and dimensions that need exploration. Evaluating existing frameworks like TAM and considering the need for a specialized framework such as the proposed one will assist researchers in choosing the framework that best aligns with their research goals and provides a robust structure for their investigation.

5.3 Future research and limitations

Further research should be conducted to determine the true effects of ChatGPT on the students' learning, attitude, and academic dishonesty. This research should focus on different educational contexts (e.g., various subject domains, and educational levels) and involve diverse student populations. Some of the ethical issues that arise when using ChatGPT in education include plagiarism, data privacy, and bias in AI algorithms, and thus, proper policies and guidelines need to be formulated. There is also a need for the development of a framework to integrate with existing cyber security and awareness frameworks to form a more holistic and responsible use policy (Mutunhu et al 2022; Maguraushe et al.2024). Thus, the proposed systematic review of academic publications about ChatGPT in education has substantiated further research and changes in educational practices.

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Biographies

Kghanya Ndlovu holds a bachelor's degree in business management and IT from the Catholic University of Zimbabwe. As a Systems Administrator at New Avakash International, a division of the Avacare Health Group, Kghanya plays a vital role in managing and maintaining the organization's computer systems, networks, and servers. Driven by a passion for continual improvement, Kghanya is pursuing a Master of Science in Information Systems at the National University of Science and Technology (NUST).

Rukudzo Ndlovu Ndlovu is an experienced IT specialist with over 15 years of experience in the transportation, ISP, and non-profit sectors. He holds an honors degree in business management and information technology from the Catholic University of Zimbabwe and is currently pursuing a Master of Science degree in information systems at the National University of Science and Technology (NUST). He aims to leverage his expertise to drive strategic business outcomes and create positive social change in his future senior roles.

Lawrence Mkwebu is a skilled software developer with a passion for automating tasks and improving efficiency. Currently, he works as a Software Developer (Java and PHP) at the National University of Science and Technology. In this role, he has played a key part in developing the new Edurole University system, including implementing modules, creating automated backups, and developing server scripts for improved system health and data management. Lawrence's well-rounded skill set extends beyond development.

Samson Chivunga is a dedicated and experienced professional in the ICT field where he developed a solid foundation in both business and technical skills. Currently, Samson is pursuing a Master's degree in Information Systems, further

enhancing his expertise in systems management and software development. As a Systems Administrator at Jacob Bethel Corporation, Samson plays a critical role in ensuring the smooth operation of computer systems and networks.

Belinda Ndlovu Belinda Mutunhu Ndlovu is a Ph.D. in Information Systems student at UNISA. She holds an MSc in Information Systems, a BSc in Computer Science, and a Postgraduate Diploma in Education. Additionally, she works as a lecturer and project coordinator for postgraduate students at the National University of Science and Technology.

Sibusisiwe Dube is a Professor at the National University of Science and Technology in Zimbabwe. She holds a BSc Hons in Information Systems from the Midlands State University in Zimbabwe, an MSc in Computer Science from the National University of Science and Technology in Zimbabwe and a PhD in Information Systems from the University of Cape Town in South Africa. She has taught courses in Computer Science, Informatics, Information Systems and Data Science at Midlands State University and the National University of Science and Technology in Zimbabwe.