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Awareness and acceptance of ChatGPT as a generative conversational AI for transforming education by Ghanaian academics: A two-phase study

Michael Agyemang	A	<i>Smart Learning Institute of Beijing Normal University, Beijing, China</i>
Adarkwah ^A		
Samuel Amponsah ^B	B	<i>University of Ghana, Ghana</i>
Micheal M van Wyk ^C	C	<i>University of South Africa, South Africa</i>
Ronghuai Huang ^D	D	<i>Smart Learning Institute of Beijing Normal University, Beijing, China</i>
Ahmed Tlili ^E	E	<i>Smart Learning Institute of Beijing Normal University, Beijing, China</i>
Boulus Shehata ^F	F	<i>Smart Learning Institute of Beijing Normal University, Beijing, China</i>
Ahmed Hosny Saleh	G	<i>Smart Learning Institute of Beijing Normal University, Beijing, China</i>
Metwally ^G		
Huanhuan Wang ^H	H	<i>Smart Learning Institute of Beijing Normal University, Beijing, China</i>

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ChatGPT;
conversational agents;
diffusion of innovation;
technology awareness.

Abstract

By increasing technology trend awareness, individuals can leverage novel and ground-breaking technologies to complete mundane activities and buy time to focus on other projects. This article presents an overview of why there is a slow pace of digital transformation in education in Ghana using ChatGPT (an advanced chatbot) as a case scenario. In this two-phase study, which used a triangulation approach (an exploratory sequential design), we found that most of the authors of publications about ChatGPT were not from the African continent or were affiliated with international institutions. A thematic analysis of interview data involving 34 academics in Ghana about ChatGPT revealed that most academics had limited knowledge about ChatGPT and artificial intelligence-powered chatbots. The main themes generated comprised the purpose of ChatGPT and chatbots, their usability and accuracy, and ChatGPT and artificial intelligence (AI) enthusiasm. The quantitative phase of the study surveyed the views of 50 academics who confirmed the minimal awareness of ChatGPT by Ghanaian academics. There were mixed views about the relevance and usefulness of ChatGPT in work-related tasks. Following the findings, we provide ways to create technology trend awareness for academics from African countries like Ghana to transition from being "laggards" to "early adopters", as explained by Rogers' diffusion of innovation theory. The findings call for policymakers and educators to promote technological awareness.

Correspondence

adarkwahmichael1@gmail.com^A

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Introduction

One of the tragedies in life is people's ignorance of available tools and devices that have the potential to transform their lives. This situation becomes more compelling when the resources are available, but people's ignorance prevents them from accessing or maximizing their use – this situation resonates with Richard Auty's (1994) resource curse theory, also termed the paradox of plenty (Auty, 2007). This unfortunate situation befell Ghana before the arrival of the colonial masters when gold was so abundant that the citizenry could not recognise its value at the time. That part of history is gone; gold and other precious minerals are scarce and of high value. However, one wonders if Ghanaians and people from other developing economies value the 'modern gold' (technology) as they should.

Undoubtedly, disruptive technologies are shaping education like never before in this intelligent era (Adarkwah & Huang, 2023). Mundane administrative, teaching and learning activities are easily catered for and facilitated through various innovative technologies, such as AI, robotics, learning analytics, blockchain, etc. With all these technological developments, many developing countries, especially those in the African region, such as Ghana, are still lagging behind the rapid utilization of advanced technologies in education (Adarkwah & Huang, 2023). Ghana launched its ICT (information and communication technology) for Accelerated Development (ICT4AD) in 2003 with the objective of transforming Ghana into an information and technology-driven high-income economy through education (Adarkwah, 2021; Adarkwah & Huang, 2023). Although the policy is almost at the end of its lifespan, Ghana is still taking baby steps towards digital transformation in education. Education is supposed to work smarter by co-evolving with technology, but there has been slow progress towards the digital transformation of education in Ghana (Adarkwah, 2021; Agyei & Voogt, 2012). One of the curtailing factors to the digital transformation of education in the country is the late recognition of new technologies and their impact on everyday life, as well as the non-readiness to use such technologies for educational purposes (International Finance Corporation, 2019).

Given the preceding, we are interested in the technology awareness of Ghanaian academics about a newly launched technology called ChatGPT (Generative Pre-trained Transformer), which is currently making waves in advanced countries in terms of research and educational practice. The emergence of ChatGPT has sparked many discussions on how it can augment or transform education. For instance, Santandreu et al. (2023) have tested the ability of chatbots to provide personalized support, a real-time interactive platform and immediate constructive feedback. Hassoulas et al. (2023) describe AI's enormous benefits to higher education as a watershed moment. On the other hand, some authors have identified the drawbacks of ChatGPT, such as limited context understanding, its inability to incorporate visuals, potential errors in the solutions it provides, its ability to enable large scale cheating in assessments by students, and inaccessibility due to cost implications (Adarkwah, 2021; Santandreu et al., 2023).

By way of context, ChatGPT is a conversational agent based on natural language processing (NLP) which engages users in a human-like conversation (Tlili et al., 2023a). According to OpenAI (2023), ChatGPT "answers follow-up questions, admits its mistakes, challenges incorrect premises, and rejects inappropriate requests." The GPT model has been evolving to reach GPT-4, which is the latest update, released in March 2023 (Rudolph et al., 2023b). The update in the GPT models seeks to enhance capabilities, and provide more fine-tuning, a larger dataset, and more human-like text generations. It can create new things and allow for more realistic natural dialogues (Santandreu et al., 2023).

Although research about ChatGPT is in its infancy, it is interesting to note that Rudolph et al. (2023b) trace the evolution of chatbots to the past 57 years. Besides, several blogs and news media continue to share the perception of various stakeholders (academics, administrators, policymakers, etc.) towards ChatGPT, especially from the early adopters (e.g. Mogavi et al., 2023). However, most of these blogs and news media are either Western-based or developed countries and regions. The paucity of conversation on ChatGPT from the African region in terms of research and news media motivated us to investigate the level of awareness of ChatGPT among academics in the African region nearly three months after its release. Pandey et al. (2021, p. 2) state that technology trend awareness is "the skill of an individual to be aware and mindful of new and popular technology that has been gaining widespread acceptance across concerned industries or markets". In this light, there is a need for educational institutions in the African region, such as those in Ghana, to be aware of the ground-breaking technological innovations like ChatGPT to revolutionize education in terms of policy and best practices in the use of the conversational agent and other emerging technologies.

It is worth adding that the awareness of new technologies has been underscored by several scholars to foster positive attitudes among users towards the rapid adoption of technology (Dinev & Hu, 2007; Pandey et al., 2021). Carpenter et al. (2022) argued that it is necessary for academics to be aware of innovative technologies to be able to implement innovative pedagogies in the classroom. In this twenty-first century, technologies, such as ChatGPT, which has transformative potential in education (Tlili et al., 2023a), need to be leveraged to equip learners with transferable skills needed in the labor market (UNESCO, 2021). Although scholars have debated the positive and negative disruptive potential of ChatGPT, scholars assert that this signals a paradigm shift in the educational landscape and other aspects of life (e.g. Mills et al., 2023; Popenici, 2023; Tlili et al., 2023a). In this light, this study seeks to answer the following research questions:

- RQ1. What are academics' awareness and understanding of ChatGPT as an AI conversational pedagogical tool?
- RQ2. What are the experiences of academics who have used ChatGPT as an AI conversational pedagogical tool in their teaching or research?

RQ3. What is the level of acceptance of ChatGPT as an AI pedagogical tool among academics?

Ghana is selected as the study context to investigate how the delay in the digital transformation might impact academics' awareness of valuable technologies in education, hence missing opportunities for revolutionizing education in Africa. The findings of the study can further provide insights to various stakeholders about the importance of raising awareness among African academics related to technological innovation to ensure quality education, which dovetails with the Sustainable Development Goals (SDG 4) of the United Nations.

Theoretical underpinning

We based our argument within the confines of the diffusion of innovation theory and ChatGPT as an artificial intelligence tool to foreground our study within the Ghanaian institutions of higher learning. In this study, we propose that Rogers' diffusion of innovation theory (DIT) (2003) is a commonly used change model for implementing technological innovation. Specifically, we will apply this theory to the introduction of ChatGPT, an innovative AI language transformer application. DIT refers to the processes that occur as people adopt a new idea, product, philosophy, or practice (Dearing & Cox, 2018). The model explains the likelihood of an individual/people adopting new technology, as is the case of hype around ChatGPT. According to Rogers (2003), there are five groups of adopters when a new technology emerges: innovators, early adopters, early majority, late majority, and laggards. There are also five stages at the individual level where the diffusion of innovation occurs: (1) knowledge awareness stage (an individual is exposed to innovation but lacks complete information about it); (2) persuasion or interest stage (an individual becomes interested in the new idea and makes additional inquiries about it); (3) decision or evaluation stage (an individual mentally applies innovation to his present and anticipated future situation and makes a decision to try it or not to try it); (4) implementation or trial stage (an individual makes full use of innovation) stage; and (5) confirmation or adoption stage (an individual decides to continue the full use of innovation) (Rogers, 2003). The focus of this study is on the first stage, knowledge awareness. We put forward that in the advent of an innovation/new technology, such as ChatGPT, most educators/academics in African countries like Ghana lack the awareness of the innovation or might have heard of it but lack complete information about its use (Adarkwah, 2021; Van Wyk et al., 2023). As a result, they are often not early adopters, as witnessed in developed countries where users (academics or learners) interact with advanced or immersive technologies. Most academics in Ghana and countries with similar contexts are often perceived as 'laggards'.

Related works on ChatGPT

Since November 2022, the hype around the phenomenon of ChatGPT has generated and exponentially accelerated the use of and adoption in education (Santandreu et al., 2023). Tlili et al. (2023a) conducted a three-stage sentiment

analysis of the concerns about using ChatGPT in education. After an analysis of 2,330 tweets from 1,530 Twitter users from December 23, 2022, to January 6, 2023, it was revealed that the public generally has a positive perception of ChatGPT and its use in educational settings (Tlili et al., 2023a). Moreover, qualitative interviews involving early adopters indicated that a cautious approach has to be taken in adopting ChatGPT in education due to issues relating to how it will transform education, response quality, perceived usefulness, personality and emotions, and ethical issues. Moreover, an analysis of user experience also highlighted issues, such as academic integrity/cheating, the accuracy of prompts, fairness in the provision of contents, privacy issues, and concerns about the manipulation of the output of information to users (Cotton et al., 2023; Tlili et al., 2023a; Vaishya et al., 2023).

Furthermore, scholars have argued that ChatGPT significantly supports learning and teaching across different levels of education (Alshurafat, 2023; Baidoo-Anu & Owusu Ansah, 2023; Khan et al., 2023; Tlili et al., 2023a; Zhai, 2022). In particular, students with disabilities could use this tool to increase their reading, writing, problem-solving, communicative skills, and language skills (Kasneci et al., 2023). These benefits also supported the professional development of teachers, academics and managers in writing reports, managing projects and supporting continuous professional initiatives (Amponsah & Bekele). Based on the latter, Rospigliosi (2023) questioned the use of ChatGPT as a tool for teaching and postulated that it could significantly transform the way we teach. Rospigliosi (2023) made particular reference to lesson planning, the creation of personalized learning experiences, assessment, and professional development.

Kasneci et al. (2023) also wrote a position paper about the educational opportunities and challenges of large language models such as ChatGPT for education. Their study revealed that ChatGPT provides educational resources for different types and levels of learners, promotes group and remote learning, empowers learners with disabilities, assists in professional training programs, and also presents opportunities for teaching (i.e. personalized learning, lesson planning, assessment and evaluation, etc.). On the same note, Mogavi et al. (2023) conducted a qualitative content analysis of four major social media platforms (Twitter, Reddit, YouTube, and LinkedIn) to identify the user experience (UX) and perspectives of early adopters toward ChatGPT. Their study found that ChatGPT is mostly used in the contexts of higher education, K-12 education, and practical-skills learning (Mogavi et al., 2023). Also, some early adopters tend to consider ChatGPT as a revolutionary technology to facilitate students' self-efficacy and motivation to learn. In terms of challenges, Mogavi et al. (2023) and Tlili et al. (2023a) proposed that there are certain competencies and literacies teachers and learners need to develop in the use of large language models like ChatGPT while users need to be aware of the limitations and drawbacks of using such technology (Rudolph et al., 2023a).

Moreover, Zhai (2022) conducted a pilot test to gauge the efficacy of ChatGPT in writing a research paper titled "Artificial Intelligence for Education". The findings revealed

that ChatGPT can aid scholars in constructing their research papers in a coherent, informative, systematic, and accurate manner. According to Zhai (2022), users do not need to have expert knowledge about the subject and the chatbot was able to provide an extremely efficient write-up within two to three hours. Zhai (2022) recommended that educators should search for ways to use ChatGPT and other AI tools to foster creativity and critical thinking in students rather than focusing on general skills. Also, because of the possibility of relying on ChatGPT for assessment tasks, new formats of assessment might be needed (Hassoulas et al., 2023; Zhai, 2022).

In a similar vein, Susnjak (2022) questioned whether ChatGPT could mark the end of academic integrity. After an evaluation to examine the ability of ChatGPT to perform high-level cognitive tasks in a human-like manner (Susnjak, 2022). Similar studies also observed that ChatGPT is able to exhibit critical thinking skills and generate highly realistic prompts with minimal input, which poses a threat to academic integrity, especially online exams in tertiary institutions (Van Wyk et al., 2023; Santandreu et al., 2023). To mitigate high levels of academic dishonesty, Chaka (2023) recommends traditional forms of assessment, such as oral examinations and the use of AI detectors.

Similarly, studies by Cotton et al. (2023) and Tsigaris and Teixeira da Silva (2023) raised the issues of academic integrity and educational opportunities offered by ChatGPT and found that it can result in plagiarism among students. It was also revealed that ChatGPT offers an undue advantage to students who can access the advanced and paid versions over those who cannot. Besides, it presents difficulty to academic staff to determine whether texts are AI-generated or human-generated (Hassoulas et al., 2023; Hosseini et al., 2023; Hu, 2023; Tang, 2023; Alshurafat, 2023). At the same time, it has been observed that ChatGPT can increase student engagement through asynchronous communication, help teachers customize exam questions or evaluations, help create an interactive and game-based assessment, and can also be used for grading students' assignments or providing feedback (Baidoo-Anu & Owusu Ansah, 2023). However, the researchers found issues with privacy, accuracy, and the possibility of biases in data training as some of the limitations found with the chatbot (Kooli, 2023; Rasul et al., 2023).

Furthermore, Gilson et al. (2022) evaluated the performance of ChatGPT using the United States Medical Licensing Examination Step 1 and Step 2 exams and further analyzed user interpretability based on the responses from ChatGPT. In comparison to earlier NLP models, ChatGPT was found to be more advanced. Its performance exceeded the 60% threshold on the National Board of Medical Examiners (NBME), which implies a pass rate for a third-year medical student (Gilson et al., 2022). The answers ChatGPT provided were found to be logical across multiple answers. Also, Kung et al. (2023) assessed the performance of ChatGPT in a United States Medical Licensing Exam (USMLE) and observed that it has the potential to assist with medical education and clinical decision-making as it performed at or near the passing score for all three exams in USMLE. It is imperative to add that GPT-4 produces even more advanced functions which are semantically richer, takes into account

contextual factors, and generates more realistic human-like dialogue (Santandreu et al., 2023; Rudolph et al., 2023b).

Frieder et al. (2023) assessed the mathematical capabilities of ChatGPT by testing it on large datasets and how it can assist professional mathematicians with routine tasks that come with their work. They observed that ChatGPT's ability to solve mathematical problems is significantly below that of an average mathematics student. According to Frieder et al. (2023), ChatGPT, in most cases, is able to understand mathematical questions but often fails to produce the right responses. This was recognized as a serious setback to ChatGPT in performing an educational task. However, the latest version (GPT-4) has plugins with improved capabilities to perform mathematical functions. It can now solve statistical, arithmetic and mathematical problems with precision and speed (Abramski et al., 2023; Santandreu et al., 2023).

Various concerns, on the other hand, were reported about ChatGPT in education, including tracking academic dishonesty and cheating. For instance, Aydin and Karaarslan (2022) expressed concerns about using ChatGPT to generate literature reviews or abstracts on a given topic. For instance, the Ithenticate software was used to check the plagiarism of the output by ChatGPT and it was found that ChatGPT is capable of helping in the academic publishing process with minimal human effort. This raises concerns about the scientific integrity of the written research outcomes. At the same time, the authors observed that ChatGPT is unable to produce original texts after paraphrasing (the Ithenticate software showed a 40% similarity index when texts created by authors and ChatGPT were assessed together). Besides, a commentary paper by Saliba and Boittsios (2023) reported that this language transformer tool could be the "death knell" in academic publishing because it could create "cheating and academic fraud" on a massive scale, which ultimately impacts scholarly creativity, innovative writing and intellectual property rights. It, therefore, comes with no surprise that out of 34 expert markers recruited by Cardiff University in the UK, 23% could not distinguish between essays generated by undergraduate students and ChatGPT, while 19% could not do the same for graduate-level papers (Hassoulas, 2023).

Currently, there are a few published studies on ChatGPT from the African perspective and in higher education. These include studies by Chaka (2023) and Ifelebuegu (2023) from South Africa and Uganda, respectively. This depicts the relative dearth of research on this novel phenomenon from an African perspective. It warrants the need to contribute to the discussion on ChatGPT using the Ghanaian context and how it can transform educational practices. Furthermore, the fast evolution of the GPT models urges in-depth research on the awareness and acceptance of these models for transforming education. For instance, the evolution from ChatGPT (which is based on GPT-3.5) to GPT-4 has already provided better capabilities, more fine-tuning, and enhanced human-like text generations. It is able to allow for more realistic natural dialogues. This is why many researchers recommend investigating ChatGPT and its new models, such as GPT-4, in terms of the awareness and acceptance of these models (Rudolph et al., 2023b; Gimpel et al., 2023).

Method

To address the research questions, we employed the sequential exploratory mixed-method design, which involves collecting qualitative data and analyzing them first, followed by quantitative data (Hanson et al., 2005). In this design, quantitative data are used primarily to augment the qualitative data. The application of ChatGPT in education is an emerging phenomenon, and research about it has gained momentum across diverse fields. The sequential exploratory design was appropriate because it helped in exploring a phenomenon and in generalizing qualitative findings to a specific population (Hanson et al., 2005). At the same time, it enabled the researchers to build on the results of the qualitative phase with quantitative data and analysis (Creswell et al., 2006). For example, in order to understand human and AI chatbot relationships, Pentina et al. (2023) used an exploratory qualitative in-depth interview analysis and followed it with a survey-based confirmatory hypotheses-testing. In the current study, we sought to explore the academics' awareness of ChatGPT as an AI-conversational agent in education and investigate their acceptance and use of ChatGPT using a modified version of the technology acceptance model (TAM) survey. Hence, the study is organized into two phases, a qualitative and a quantitative one. In Study 1, the qualitative phase explores academics' exposure and a broad understanding of ChatGPT within three months of its launch (January 2023). Afterwards, the quantitative phase in Study 2 presents academics' use and acceptance of ChatGPT as an AI tool in education. Study 2 was conducted two months after the qualitative phase (March 2023) after many academics had interacted with ChatGPT.

Study 1 (qualitative phase)

Design

The narrative inquiry approach is used when detailed accounts or experiences from individuals are collected and chronologically ordered to ascertain the meanings of those experiences. The "narrative might be the term assigned to any text or discourse, or it might be text used within the context of a mode of inquiry in qualitative research" (Creswell et al., 2007, p. 240) and "narrative is understood as a spoken or written text giving an account of an event/action or series of events/actions, chronologically connected" (Czarniawska, 2004, p. 17). In the context of this study, the narrative refers to the experiences of the academics with their exposure to ChatGPT.

Participants

Academics included in the study were conveniently sampled because they were accessible during the time of the study and voluntarily opted to participate in the study. They included professors ($n = 3$), associate professors ($n = 11$), senior lecturers ($n = 7$) and lecturers ($n = 13$). The 34 academics whose views were solicited for this study were drawn from three higher education institutions in Ghana. For ethical reasons, no names were used. The selection of

the institutions and study participants is purely based on convenience sampling.

Ethical considerations

Before we started the study, ethical considerations were obtained, and participants gave consent. Though data collection for this study was via semi-structured interviews, ethical considerations were put in place. The academics were informed about the use of the conversations for research purposes. In view of that, the data collected were used for no other purpose other than for the publication of this study. Also, participants' names were replaced with their designation and number during the discussion of themes (e.g., a professor who is the third participant in the study is represented as P3). All efforts were put in place to ensure that the quotations used for this study cannot be traced to the participants. Lastly, the academics were contacted close to the publication of this study to confirm the use of the information they had shared. This was also for the purposes of member checking as the participants agreed that the transcripts represented the views they shared during the interviews.

Data collection and instrumentation

A semi-structured interview guide was developed based on extant literature. For example, one key study that guided the construction of the interview guide was the study on techno trend awareness by Pandey et al. (2021). The interview guide was assessed by the authors for modification until a consensus was reached. All the semi-structured interviews for the purpose of data collection took place between January 1st and January 31st, 2023. The conversations were all in the English language. In eliciting data from the study participants, phone interviews with the participants using WhatsApp audio calls were conducted. Some of the key questions used to elicit data during the informal virtual conversations included: 'Tell me about your general knowledge of chatbots.' 'Have you heard about ChatGPT?' 'What has been your experience with ChatGPT?' (see Appendix 1). The duration for each interview was approximately 35 minutes.

When the data collection had ended, we performed a thematic analysis of the interview data to detect recurring words or themes in the conversations. According to Braun and Clarke (2006) and Nowell et al. (2017), this approach is flexible and well-structured in identifying extracts to generate themes manually. Though Holloway and Todres (2003) describe this manual process as time-consuming, it was helpful to us as we were able to identify the latent meanings of the information shared by the study participants. The generated themes were discussed among the authors of the study to agree on themes to be used for the study.

Data analysis

Two of the researchers manually coded the interview transcripts by extracting key information and assigning codes to them. Line-by-line open coding was used in generating the final themes of the study (Khandkar, 2009). To ensure trustworthiness, an inter-coder agreement was reached (i.e., the researchers used the interview data in a similar manner). The four main themes generated from the conversations were: (1) misrepresentation of the purpose of ChatGPT and chatbots, (2) lack of digital knowledge and technical skills and the usability of ChatGPT, (3) lack of exposure and advocacy (accuracy) of ChatGPT, and (4) ChatGPT and AI enthusiasm (see the next section).

Study 2 (quantitative phase)

Research design

A quantitative survey design was used to investigate the awareness and acceptance of ChatGPT as an AI conversational tool for education within five months of its launch. First, we wanted to assess whether academics' awareness of ChatGPT improved two months after the qualitative study. Furthermore, we wanted to assess the acceptance and use of ChatGPT by academics as a pedagogical tool. The survey helped in probing further into the day-to-day use of ChatGPT by academics (Creswell et al., 2007). The survey design enabled the researchers to administer a questionnaire to the study sample to examine their attitudes, perceptions, and behaviors about ChatGPT (Creswell, 2018).

Participants

Academics from the qualitative study and their colleagues formed the sample of the study. The academics in Study 1 were contacted to answer the questions on the survey and were encouraged to invite colleagues who were somewhat exposed to ChatGPT and were willing to participate in the study. That is, all the 34 academics in the qualitative study were re-selected and 16 academics were new recruits based on their willingness to join the study. A convenience sampling technique was used to recruit the academics included in the study because they were accessible during the time of the study and voluntarily opted to participate in the study. They were duly informed of their right to withdraw from the study at any time. In all, 50 academics responded to the survey. Out of the 50 participants who answered the survey, 23, representing 46%, were aged 45 and above (Figure 1). 43 (86%) were male, and seven (14%) were female (Figure 2). Twenty-six academics, constituting 56%, were from the field of education (Figure 3), 84% of them used ChatGPT-3.5, and 16% used the plus version (GPT-4) (Figure 4).

Figure 1-4 presents the demographic information of participants.

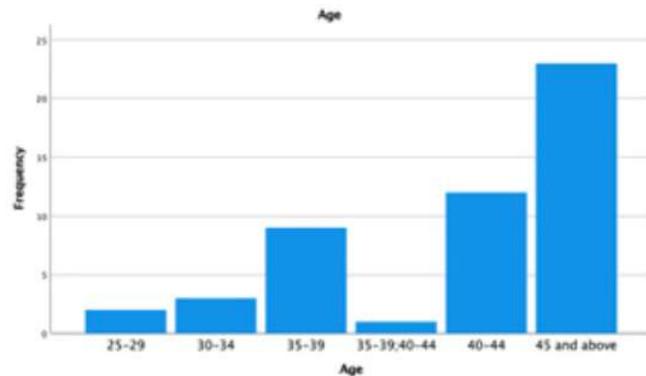


Figure 1: Age of academics

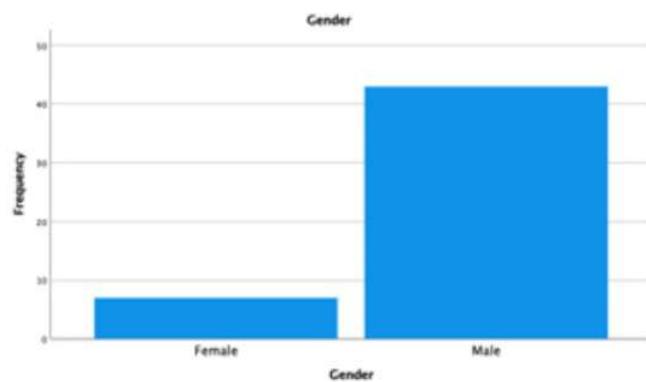


Figure 2: Gender of academics.

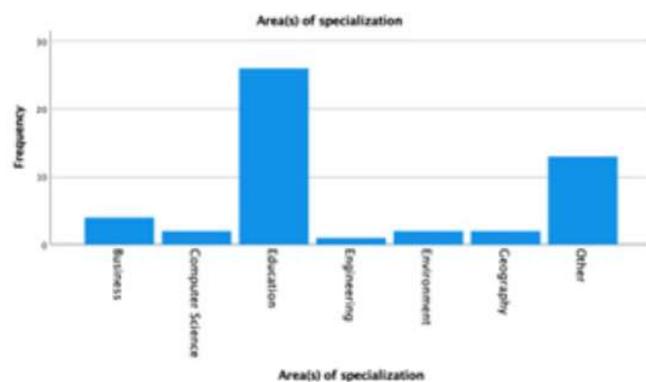


Figure 3: Area of specialization of academics.

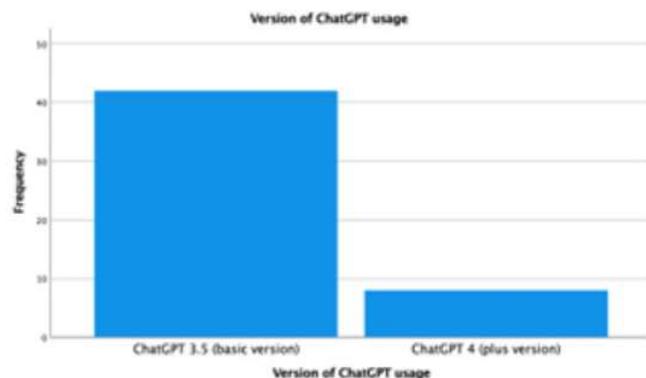


Figure 4: Version of ChatGPT used by academics.

Ethical considerations

Participants' informed consent was gained before distributing the online survey. We adhered to all ethical principles in the Declaration of Helsinki.

Data collection and instrumentation

Google Forms served as the online platform for the survey items. The survey questions consisted of two sections. Section A took the demographic information of the participants, and Section B measured the awareness and acceptance of ChatGPT by academics. The survey questions (Section B) were developed based on the Technology Acceptance Model (TAM) survey. We modified the items on the TAM survey to suit the context of this paper. Four items (i.e. job relevance, perceived usefulness, perceived ease of use, and perceived enjoyment) comprising fourteen questions (14) made up the final items on the survey. The final questions which were used for collecting data were agreed upon by the authors of the study. The internal consistency of the survey was also checked. A Cronbach's alpha value of .876 was obtained, indicating that the items on the survey were reliable for eliciting data from the study participants. All items are measured on a seven-point Likert scale (where 1 = strongly disagree; 2 = moderately disagree, 3 = somewhat disagree, 4 = neutral (neither disagree nor agree), 5 = somewhat agree, 6 = moderately agree, and 7 = strongly agree). Tables 1-4 present the ratings of participants in the study. A link to the online survey was distributed to academics from the three institutions in the country, and they were encouraged to invite colleagues to answer the questions in the survey. Overall, the data collection took a month to complete.

Data analysis

Descriptive statistics (mean, standard deviation, and percentages) were used in presenting the data. Additionally, correlational analysis was performed between the main variables (the five items) that made up the survey.

Qualitative results

Theme 1: Misrepresentation of the purpose of ChatGPT and Chatbots

A thematic analysis of the interview data revealed that as of January 31, 2023, the academics in this study lacked awareness of ChatGPT. Most of the participants in the study had not heard about ChatGPT. In some instances, the interviewer had to explain the meaning of a "chatbot", not to mention ChatGPT, to some of the academics. Although many academics might have interacted with chatbots before through a visit to a blog, an official website, or an online store, they did not know the term "chatbot" or what it stands for. A probe into the inquiry about ChatGPT and what chatbots, in general, stand for suggests that academics in this study perceived that their prior conversations with chatbots were with human operators. Two of the academics perceived ChatGPT at the time as a social media mobile application

available on the App Store or Google Play Store. While an app version of ChatGPT might be in sight in the near future, it is currently web-based in nature. Some of the academics who had heard about ChatGPT did not pay attention to it, did not sign up, or were doubtful about creating an account.

What are chatbots and what do they do? Personally, I do not know what ChatGPT is. If it is an app, I can download it from my Google Play Store and see what it is. (AP6)

Is ChatGPT a new app? I might have heard about chatbots, but I have not taken the time to read about them to know their main purpose. But after our talk, I will check it out. (L7)

Yeah, I have interacted with a chatbot before from a marketing store, but I thought I was talking to a service personnel or customer care. This is interesting. So, what is the main purpose of ChatGPT? (P3)

The narratives, thus far, depict a complete lack of knowledge and conceptual understanding of ChatGPT, an application that has, in a short space of time, impacted the educational and other sectors of human life. Gauging by Rogers' DIT (2003), this evidence puts the study participants in the laggards' group of adopters as against, for instance, Rudolph et al. (2023b) who interrogated and challenged the intelligence of chatbots. Our study was interested in how the knowledge gap impacted the technical skills and usability of the system among the participants. This is presented under the ensuing sub-theme.

Theme 2: Lack of digital knowledge and technical skills and the usability of ChatGPT

A majority of the academics inquired about how they could use ChatGPT. Questions were asked if it could be used offline or whether the Internet is needed to access it. Also, some of the academics inquired if they had to have some technical skills or should have prior knowledge about chatbots before they could effectively use ChatGPT. Questions were also asked about best practices in the use of ChatGPT in educational settings to avoid issues relating to plagiarism.

Is it something I can use like Grammarly to enhance my work, and do I have to have some special skills to be able to use it? (L13)

Right now, I do not know how useful it can be for me. But I will check it out and see how I can use it in my research and teaching. (P3)

Though the study participants may be categorized as laggards, one will not be wrong to identify them as people who have an interest in adopting technology. The challenges with data cost and digital gadgets in the study setting might be a factor working against technology adoption.

Can I download the ChatGPT and use it offline? If I do not have mobile data or access to WIFI, how can I use it? (SL6)

Theme 3: Lack of exposure and advocacy (accuracy) of ChatGPT

Because most of the participants lacked knowledge of chatbots and generative conversational AI user experience, their primary source of information about ChatGPT was the interviewer who interacted with them. Questions were asked by some of the academics concerning the accuracy of ChatGPT. Sample conversations the first author or other Twitter users had with ChatGPT were sent to the academics for their perusal. As an early adopter of ChatGPT, the first author expounded on his experiences with ChatGPT to the academics.

Oh, that is cool! But if it can give me responses to my questions, how do I know that the answers are correct? (L5)

Because I have not used it before and I am just hearing about it, maybe, you can tell me some of your experiences when you asked ChatGPT a question. Were you satisfied with the quality of the responses it gave you? (SL3)

I am interested to know more about ChatGPT and how it can help me in my work. But can the output from it be trusted, or do I have to do more investigations on my query after getting a response from ChatGPT? (AP, 1)

Theme 4: ChatGPT and AI enthusiasm

During the interviews, the researcher asked each of the academics to read about ChatGPT on Google. It was observed that the academics in the study expressed a high sense of enthusiasm about the potential of ChatGPT and what it could mean for education. The academics were in awe of how AI is shaping the educational landscape and other sectors of society. In one of the conversations, an academic texted that he was happy to know about ChatGPT and will introduce it to his students and sister who was studying in one of the tertiary institutions in Ghana.

Wow, this is good. ChatGPT is able to give exact responses from the blogs I read. When I get to my office, I will try and register and start using it. Thank you! (SL3)

I think ChatGPT will bring significant changes to how we educate students. I am very happy about how technology is driving education. We just need to use it for our benefit. (AP9)

"I will try and introduce ChatGPT to my colleagues. I know they will be surprised by its abilities. After briefly searching about it, I am impressed. I think both teachers and students can benefit from it." (P2)

Similar to the reflections under theme 2, the participants' awareness level is low, which might be the key factor driving their late acceptance of the innovative AI-powered chatbots. However, that did not affect their enthusiasm for its future usage, a depiction of the second stage (persuasion or

interest) of Rogers' (2003) DIT.

Quantitative results

Most of the academics used a specific version of ChatGPT because of cost or relevance to their work (Figure 5). Webinars and social media platforms other than Facebook and Twitter were the main media of exposure to ChatGPT for a majority of the academics (Figure 6). Most academics spend one hour daily using ChatGPT (Figure 7). Most of the participants considered themselves basic users of ChatGPT (Figure 8).

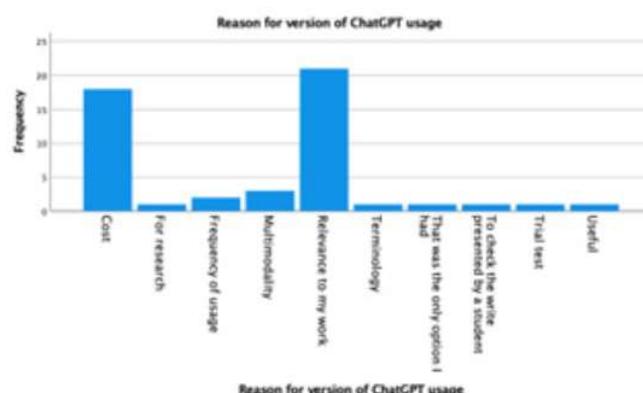


Figure 5: Reason for ChatGPT use by academics.

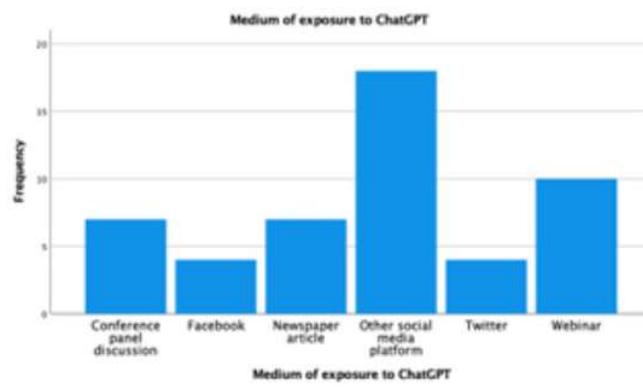


Figure 6: Medium of exposure to ChatGPT.

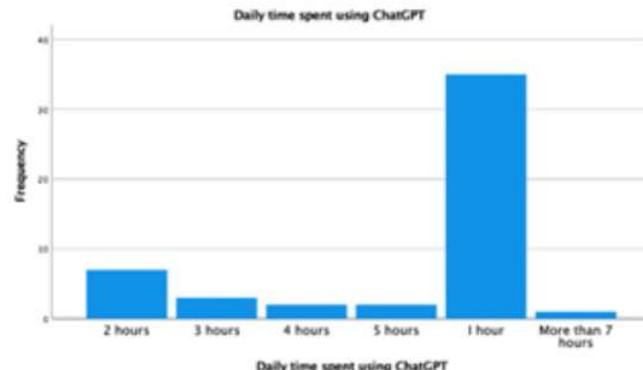


Figure 7: Daily time spent using ChatGPT by academics.

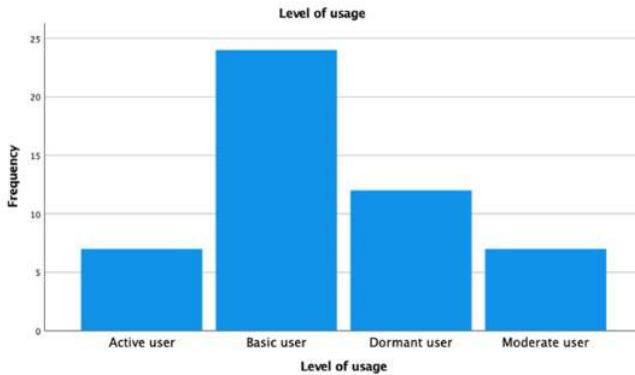


Figure 8: Level of usage of ChatGPT by academics.

Table 1: Descriptive statistics of job relevance of ChatGPT.

Variable	n	SD	MD	SWD	N	SWA	MA	SA	M	SD
Job Relevance	50								4.51	1.89
1. Are you in agreement or disagreement that the use of ChatGPT is important to your work?		10%	6%	18%	14%	6%	20%	26%		
2. Are you in agreement or disagreement that the usage of ChatGPT is relevant to your work?		12%	10%	12%	10%	10%	22%	24%		
3. The use of ChatGPT is pertinent to my various teaching and research-related tasks.		14%	6%	14%	12%	24%	14%	16%		
Note.										

n (number of participants), SD (Strongly disagree), MD (Moderately disagree), SWD (Somewhat disagree), N (Neutral), SWA (Somewhat disagree), MA (Moderately agree), SA (Strongly agree), M (mean), and SD (Standard deviation)

From Table 1, it can be observed that a higher percentage of the participants moderately agreed (20%) or strongly agreed (26%) that ChatGPT is important to their work. However, a majority of the participants also moderately agreed (22%) or strongly agreed (24%) that ChatGPT is not relevant to their work. That is, while they recognized the importance of ChatGPT in aiding them in completing their work, they did not perceive its relevance. This could be because many academics do not actively use AI tools in their work or are prone to resist integrating new technology in their work.

Table 2: Descriptive statistics of perceived usefulness of ChatGPT.

Variable	n	SD	MD	SWD	N	SWA	MA	SA	M	SD
Perceived Usefulness	50								4.12	1.89
4. Using ChatGPT improves my performance at school.		18%	8%	16%	10%	18%	22%	8%		
5. Using ChatGPT in my learning increases my productivity.		14%	10%	14%	12%	16%	20%	14%		
6. Using ChatGPT enhances my effectiveness at school.		18%	8%	12%	18%	20%	14%	10%		
7. I find the ChatGPT to be useful in my learning.		16%	6%	8%	12%	28%	18%	12%		
Note.										

n (number of participants), SD (Strongly disagree), MD (Moderately disagree), SWD (Somewhat disagree), N (Neutral), SWA (Somewhat disagree), MA (Moderately agree), SA (Strongly agree), M (mean), and SD (Standard deviation).

It can be seen that from Table 2, although a higher percentage of the participants moderately agreed that ChatGPT improves their performance (22%), a higher percentage also strongly disagreed that ChatGPT improves their performance at school (18%). The number of academics who strongly agreed that ChatGPT enhances their effectiveness at school (10%) is less than those who strongly disagreed that it does not enhance their effectiveness at school (18%). Similarly, only 12% of the academics perceived ChatGPT to be useful in their learning while 16% strongly disagreed. Generally, the perceived usefulness of ChatGPT among academics was somewhat low (M = 4.12, SD = 1.89).

Table 3: Descriptive statistics of perceived ease of use of ChatGPT.

Variable	n	SD	MD	SWD	N	SWA	MA	SA	M	SD
Perceived Ease of Use	50								4.75	1.67
8. My interaction with the ChatGPT is clear and understandable.		10%	2%	14%	10%	32%	22%	10%		
9. Interacting with the ChatGPT does not require a lot of my mental effort.		12%	2%	10%	16%	18%	30%	12%		
10. I find the ChatGPT to be easy to use.		10%	6%	6%	16%	8%	32%	22%		
11. I find it easy to get the ChatGPT to do what I want it to do.		12%	2%	8%	14%	14%	28%	22%		
Note.										

n (number of participants), SD (Strongly disagree), MD (Moderately disagree), SWD (Somewhat disagree), N (Neutral), SWA (Somewhat disagree), MA (Moderately agree), SA (Strongly agree), M (mean), and SD (Standard deviation)

The Table illustrates that academics rated the perceived ease of use of ChatGPT as fairly low (M = 4.75, SD = 1.67). Nonetheless, most of the academics moderately agreed that their interaction with ChatGPT was clear and understandable (22%) as opposed to only 10% who strongly disagreed. The number of academics who moderately agreed that interacting with ChatGPT does not require mental effort was higher than those who strongly disagreed (12%). A similar finding can be seen in the rating between how academics perceived ChatGPT to be easy to use and easy to get ChatGPT to carry out commands.

Table 4. Descriptive statistics of perceived enjoyment of ChatGPT.

Variable	n	SD	MD	SWD	N	SWA	MA	SA	M	SD
Perceived Enjoyment	50								4.80	1.68
12. I find using ChatGPT to be enjoyable.		8%	0%	10%	20%	22%	24%	16%		
13. The actual process of using ChatGPT is pleasant.		8%	0%	10%	18%	22%	22%	20%		
14. I have fun using ChatGPT.		12%	2%	8%	20%	22%	18%	18%		
Note.										

n (number of participants), SD (Strongly disagree), MD (Moderately disagree), SWD (Somewhat disagree), N (Neutral), SWA (Somewhat disagree), MA (Moderately agree), SA (Strongly agree), M (mean), and SD (Standard deviation).

Table 4 demonstrates that a higher percentage of academics moderately agree (24%) and strongly agree (26%) that ChatGPT is enjoyable to use. A similar finding can be seen in their ratings of how pleasant and fun ChatGPT is perceived to be. A higher number of academics strongly agreed that ChatGPT is pleasant (18%) and fun (18%) as opposed to those who did not.

Table 5. Correlational analysis of study variables.

	Awareness	Job Relevance	Perceived Usefulness	Perceived Ease of Use	Perceived Enjoyment
Awareness	1	.634**	.688**	.431**	.523**
Job Relevance	.634**	1	.761**	.490**	.724**
Perceived Usefulness	.688**	.761**	1	.283*	.523**
Perceived Ease of Use	.431**	.490**	.283*	1	.801**
Perceived Enjoyment	.523**	.724**	.523**	.801**	1

*p ≤ 0.05, **p ≤ 0.01, *** p ≤ 0.001

Based on the information in Table 5, there is a significant correlation between Awareness and Job Relevance – r = 0.634** (p < 0.01), Awareness and Perceived Usefulness: r = 0.688** (p < 0.01), Awareness and Perceived Ease of Use: r = 0.431** (p < 0.01), Awareness and Perceived Enjoyment: r = 0.523** (p < 0.01). A positive significant correlation was found between Job Relevance and Perceived Usefulness: r = 0.761** (p < 0.01), Job Relevance and Perceived Ease of Use: r = 0.490** (p < 0.01), Job Relevance and Perceived Enjoyment: r = 0.724** (p < 0.01). A significant Pearson correlation coefficient was found between Perceived Usefulness and Perceived Ease of Use: r = 0.283* (p < 0.05), Perceived

Usefulness and Perceived Enjoyment: $r = 0.523^{**}$ ($p < 0.01$), Perceived Ease of Use and Perceived Enjoyment: $r = 0.801^{**}$ ($p < 0.01$). Overall, a significant positive correlation was found among all the variables. This means that an increase in one variable results in a subsequent increase in another variable. For example, regarding ChatGPT awareness, the more an academic is aware of ChatGPT, the more they find it relevant and useful to their work, easy to use and enjoyable when using it.

Discussion of findings

After the launch of the AI-powered conversational agent, ChatGPT, we have discovered an intense excitement and fear for the use of the generative pretrained transformer tool in teaching. With reference to what ChatGPT is and the awareness of academics in Ghanaian educational institutions, several issues emerged. We found that most of the participants did not have a conceptual understanding of ChatGPT and how it could be applied to learning, teaching and personal development. A possible reason for this could be that although ChatGPT is a new phenomenon that has created hype for the past few months, there was little research published about it during the time of the interviews. Now, the hype has generated a lot of academic research publications on AI-conversational agents uses in education. Many of the studies have reported significant results of ChatGPT as an AI language tool that creates opportunities for learning and teaching (Alshurafat, 2023; Baidoo-Anu & Owusu Ansah, 2023). Moreover, a few studies by African scholars located at universities outside the continent had published on this phenomenon (Tlili et al., 2023a; Baidoo-Anu & Owusu Ansah, 2023; Alshurafat, 2023). Studies revealed that ChatGPT is a "game-changer" that will transform all assessment protocols (Stokel-Walker & Van Noorden, 2023), and ChatGPT-based learning is a motivator for teaching (Ali et al., 2023). These studies became the drivers for Africans to launch the stage to start implementing AI machines for learning and teaching in daily practices. The study participants had misrepresentations of the purpose of using ChatGPT and chatbots in learning and teaching. Most of the participants in the study had not heard about ChatGPT. Based on the understanding of participants, this lecturer echoed the following view "Is ChatGPT a new app? I might have heard about chatbots, but I have not taken the time to read about them to know their main purpose. But after our talk, I will check it out" (L7).

In view of the lack of knowledge of participants, most had misconceptions of what artificial intelligence is, in particular, ChatGPT as a language tool and how to use it for teaching. They viewed it as a social media mobile application which one could download from Google Play Store. Because of a lack of digital literacy skills, academics quizzed if they had to have some technical skills or should have prior knowledge about chatbots before they could effectively use ChatGPT for teaching and learning. Moreover, studies indicated Africans must be aware and embrace innovative technologies such as ChatGPT, which has transformative potential in education and equip learners with transferable skills needed in the labour market (Santandreu et al., 2023; Rudolph et al., 2023b; Tlili et al., 2023a; Carpenter et al., 2022; UNESCO,

2021). It was evident that many of the participants lacked user experience. Their primary source of information about ChatGPT was from the authors during the data collection stage. The awareness of new technologies has been underscored by several scholars to foster positive attitudes among users towards the rapid adoption of technology (Dinev & Hu, 2007; Pandey et al., 2021).

We were to find out how academics experienced when exposed to ChatGPT as a language tool. Based on Rogers' (2003) DIT, the academics in this study fall in the laggards or, at best, late majority category. This situation has been enabled by factors such as the generally slow progress and late recognition of technological innovation in many African and other developing economies (Adarkwah, 2021; Agyei & Voogt, 2012; International Finance Corporation, 2019). In the case of this research, most of the participants were unaware of the AI facility and what it could do. This situation is encapsulated in a reflection shared by a participant, "Yeah, I have interacted with a chatbot before from a marketing store, but I thought I was talking to a service personnel or customer care. This is interesting. So, what is the main purpose of ChatGPT?" (P3).

Despite the lack of awareness of the academics and the limitations which had compounded the situation, it was interesting to note that the participants expressed enthusiasm after they had been informed about ChatGPT and how it could transform their teaching and learning. This is a depiction of their persuasion and interest (Rogers, 2003) in the technology after a mental assessment of its capacity to create more meaningful and impactful teaching and learning environments. This enthusiasm and interest are in consonance with assertions by researchers (such as Chaka, 2023; Dinev & Hu, 2007; Pandey et al., 2021) that positive attitudes toward new technologies could foster innovative classrooms. In addition, such innovative technologies, especially ChatGPT, are touted as transforming education generally and equipping students with transferrable skills, which are requirements to fit into the ever-competitive 21st-century labour market.

Furthermore, this research demonstrated academics' perspectives in Ghana about ChatGPT and its acceptance as an innovative technology. Considering the poverty of the academics' awareness of ChatGPT in the qualitative phase of the study, they demonstrated limited knowledge about the use of ChatGPT or how it can facilitate their teaching and academic growth. This leverages promoting technological awareness and digital skills for the university teachers to be able to optimally function in today's job market through different channels such as newsletters and blogs, technology podcasts, technology conferences and forums, social media, technology clubs, technology professional development, and partnerships and technology centres (Adarkwah & Huang, 2023; Bizclik, 2021; Moore, 2022).

Although they believe that ChatGPT is important to their profession, the majority found that it is not relevant to their work. This could be because many academics do not actively use AI tools in their work or are prone to resist integrating new technology in their work (Van Wyk et al., 2023; Rogers, 2003). This also could be because of the novelty effect of

this technology, especially because they lack the awareness of it and have a positive attitude to possibly adopt it.

The findings of this research raise a debate about using Chatbots and academic performance when there is a contract in the academic's opinions. Even this debate extended to the potential of ChatGPT to enhance their effectiveness at school and to be useful in their learning (Santandreu et al., 2023; Rudolph et al., 2023b). This could relate to the nature of their use to serve their learning objectives, their majors, or their attitudes toward technological tools. It is early to ultimately judge its effectiveness and usefulness in their learning after a few months of its launch, though Tlili et al. (2023b) have questioned the quality of reviews conducted on the phenomenon. Therefore, we suggest conducting follow-up studies to verify their perception of using it when they are fully aware of AI technologies in education.

Since academics rated the perceived ease of use of ChatGPT as fairly low, this is consistent with theme two of the qualitative study that emphasized the lack of technical skills and usability (Van Wyk et al., 2023). Meanwhile, their interaction with ChatGPT was clear and understandable and did not require mental effort. This emphasizes the importance of a thorough understanding how to use it in terms of user experience (Mogavi et al., 2023). Everyone can easily interact with the conversational AI to ask follow-up questions and find answers, but lacking the awareness and knowledge of implementation could affect the ease of use perception. Thus, we suggest arranging institutional training for academics to introduce the mechanisms and nature of AI technologies supported by the responsible use and ways of integration in education.

Although the general findings of this research indicated the minimal awareness of ChatGPT by academics and mixed views about its relevance and usefulness in work-related tasks, a higher percentage agreed that ChatGPT is enjoyable to use, pleasant and fun (Van Wyk et al., 2023). It can be explained in light of satisfying their needs and curiosity about this technology. They possibly used to use search engines and refine the search results for placing information. Unlike this way, they simply felt that it could save their time and effort instead of browsing hundreds of websites and resources, hence reflecting on their perceptions of enjoyment. Drawing on the basic psychological needs theory as a sub-theory of a human motivation macro-theory known as self-determination theory (Ryan & Deci, 2000), satisfaction of the need for autonomy is crucial for motivation. Thus, they enjoyed trying the new tool or functions because they were motivated to use it, generated by their curiosity.

According to the research result, we suggest extending the study context to include a wide range of participants from different majors in Ghana, considering the factors affecting their adoption of the AI tools in education (e.g. the academic background, age, the prior experience of using technological tools, etc.).

Ways of promoting techno-trend awareness and fostering technology acceptance in Ghana

Technological awareness and acceptance in this AI era are important because of the rapid use of different types of digital tools in work-based and educational settings. It is almost difficult to refrain from using technology in everyday life in our modern society. An individual has to possess digital skills to be able to function optimally in today's job market. The labour market requires workers to be digitally literate to ensure high work productivity. Those who are proficient with technology are often perceived as having more career opportunities than those who are not digital natives. Human-machine collaboration, integrating technology into teaching, technology for inclusivity, etc. all indicate how technology is pivotal in this fourth industrial revolution. Thus, technology trend awareness can foster the rapid uptake of novel technologies, creativity, and innovation. Below, we enumerate ways education systems, particularly higher education, can promote technology trend awareness.

Newsletters and blogs: Institutions of higher education (IHE) can subscribe to newsletters and blogs that provide information on technological trends and share it with their academic staff and students. Some of the world's top technology newsletters include Technology Magazine, TechCrunch, The Other Valleys, Dense Discovery, and CB Insights (Bizclik, 2021).

Technology podcasts: IHE can create a technology podcast that relays information on novel innovations with learners. Additionally, there are several technological podcasts that can be made available in school libraries or reading rooms for academics. An example of such a podcast is This Week in Tech (TWiT). A podcast could be a great source of technology news and information (Moore, 2022). Podcasting forms part of the wider expansion and diversification of digital technology in education in response to the need for increased student engagement, the incorporation of alternative methods of inquiry and epistemologies into curricula, and the promotion of innovative and extensive dissemination of knowledge and research (Moore, 2022).

Technology conferences and forums: Research about the latest technologies and the best practices on their use can be shared during organized conferences that focus on technology. Scholars can make poster presentations or participate in technology exhibitions during academic conferences. For instance, at the first author's university, a forum is been organized on ChatGPT. Fisher and Purcal (2017) talked about how e-learning trends appear on top of the agenda of scientific conferences. Such forums could be replicated in Ghanaian educational institutions through collaborations with universities in developed economies, which are early adopters of technological innovations.

Good social media use: Fostering good social media use by encouraging academics to follow pages and groups that provide information on technological trends and education. For example, news about ChatGPT and other AI products is often discussed on Twitter and LinkedIn pages. Academics can also watch news about technology on YouTube. Online

communities like Quora and Reddit's technology can provide academics with the latest news on technological products. Moon and Hadley (2014) mentioned that news organizations make use of Twitter as a good source of diverse kinds of information. Wilson (2000) adds that librarians are able to monitor technology trends with podcasts, RSS and Twitter (rebranded as X).

Technology clubs/groups: IHE can create technology associations in the form of clubs and groups where insights can be shared about the latest trends in technology.

Technology professional development: Professional training programmes on the use of technology can be organized for academics through seminars and workshops (Adarkwah & Huang, 2023). Academics can receive real-time or hands-on training on how to use new technologies like ChatGPT. The introduction of new technologies can be difficult for teachers to grasp its use, making technology professional development urgent (King, 2002). Martin et al. (2010) also found effective technological professional development to be correlated with high-quality lesson plans and learning performance.

Partnerships and technology centers: IHE can partner with both domestic and international tech companies to provide information about novel technologies and their use (Amponsah & Bekele, 2022). Technological centers can be created with the sole purpose of educating academics about latest technologies. Computer science programmes and information technology communication (ICT) centers can be leveraged to provide news about ground-breaking technology to academics.

Conclusion, implications, and limitations

The study's findings serve as a foundational assessment of recent literature on ChatGPT and why the discussions on ChatGPT are a classic case scenario of the slow pace of technological growth in IHE in most emerging economies such as Ghana. The conversations with 34 academics presented in this study suggest that they lacked knowledge about ChatGPT. Specifically, academics had limited knowledge about what AI chatbots mean and inquired about the purpose of ChatGPT, how it can be used, and the extent to which outputs in response to user commands are accurate. Generally, the academics in the study had a high enthusiasm about the educational possibilities ChatGPT can afford after being exposed to the chatbot.

Moreover, the quantitative phase of the study also confirmed that participants were not highly aware of ChatGPT even after several months had elapsed after its launch and the public hype about ChatGPT was gaining ground. Regarding the job relevance and perceived usefulness of ChatGPT, there were conflicting views among academics. Nonetheless, most of the academics perceived the interface of ChatGPT to be fun to use and easy to navigate.

From a theoretical implication perspective, the study serves as a springboard for researchers in Ghana and peer countries to join the discussions on ChatGPT and assess the readiness

of faculty, staff and students to use AI chatbots like ChatGPT for educational purposes. Another research area to focus on is how IHE can create or revise their educational policies to include advanced chatbots like ChatGPT for pedagogical purposes. Policies can focus on academic integrity issues and means of providing easy access to ChatGPT Plus, which is a payable/subscription version of ChatGPT. Also, regarding human-machine collaboration, IHE can focus on how to effectively integrate ChatGPT into teaching. IHE can create practical guides on the safe use of ChatGPT from scratch or make use of a publicly available handbook for educators.

Practically, the extent of the 'unawareness' of intelligent chatbots like ChatGPT among academics in Ghana is a wakeup call for university leaders and educators to find various means to create technological trend awareness in IHE and other levels of education which could benefit from the promising features of ChatGPT. Without promoting technology trend awareness, the likelihood of fostering the rapid adoption of innovative technologies would be near impossible. Some of the key strategies suggested earlier include a subscription to technology newsletters and blogs, good use of social media for learning new tech information on X and LinkedIn, the provision and creation of technology podcasts, technology professional development for academics, and organizing tech conferences and forums, among others.

A limitation of the study is that the review approach chosen was not systematic in nature. A more rigorous approach would be needed to focus on presenting findings on different dimensions of ChatGPT. Also, a large-scale quantitative study on ChatGPT awareness and readiness to use in educational settings would be beneficial. The limitations notwithstanding, this study has broken grounds for academics, IHEs and stakeholders in education in Ghana and similar countries to rethink higher education to expedite the rate of adoption of generative AI tools such as ChatGPT.

Acknowledgement

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Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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Appendices

Appendix 1: Qualitative phase (interview questions).

This interview aims to investigate your general awareness and acceptance of chatbots, specifically ChatGPT, in education. The interview contains 5 open-ended questions which have been derived from the objectives of the study. Anonymity will be ensured, and all answers will be confidential. Please answer each question with sufficient information and details to ensure the usefulness of this interview and study. You are welcomed to also probe into the questions. Thanks for your time.

Section A

What is your position at the university?

What is your gender?

Section B

1. What do you know about chatbots in general?
2. What is your experience in using chatbots?
3. How familiar are you with ChatGPT as a generative AI tool for education?
4. What is your experience in using ChatGPT?
5. In your opinion, to what extent can chatbots, particularly ChatGPT, be beneficial for your work?

Appendix 2: Quantitative phase.

Section A

Thank you very much for accepting this invitation to participate in this survey which aims at investigating the acceptance of ChatGPT for educational purposes. The survey has two main sections; 1. Demographic information and 2. Questions. The survey questions are split into nine (9) sections with each consisting of a number of questions. In total, it takes an average of five (5) minutes to complete the questionnaire. All answers will remain confidential. Please, select the most appropriate answers. Thank you!

Demographic Data

This section collects your personal information; age, gender, and discipline at school. Please indicate/select the appropriate answer.

1. What is your age?
 20-24
 25-29
 30-34
 35-39
 40-44
 45 and above
2. What is your gender?
 Male
 Female
3. What is your area of specialization?
 Education
 Business
 Computer Science
 Geography
 Engineering
 Environment
 Philosophy
 Law
 Health and Medicine
 Other

4. What version of ChatGPT do you use?

- ChatGPT 3.5 (basic version)
- ChatGPT 4 (plus version)

5. Why do you use the version of ChatGPT you use?

Cost

- Frequency of usage
- Relevance to my work
- Multimodality

6. How did you get to know about ChatGPT and its use?

- Webinar
- Newspaper article
- Conference panel discussion
- Twitter
- Facebook
- Other social media platforms

7. On the average how much time do you spend on ChatGPT each day?

- 1 hour
- 2 hours
- 3 hours
- 4 hours
- 5 hours
- 6 hours
- 7 hours
- More than 7 hours

Section B

Questions on acceptance of ChatGPT

All items are measured on a 7-point Likert scale (where 1: strongly disagree; 2: moderately disagree, 3: somewhat disagree, 4: neutral (neither disagree nor agree), 5: somewhat agree, 6: moderately agree, and 7: strongly agree), except Use of ChatGPT, which was measured using a multiple choice option.

Variable	SD	MD	SWD	N	SWA	MA	SA
Perceived Usefulness							
4. Using ChatGPT improves my performance at school.							
5. Using ChatGPT in my learning increases my productivity.							
6. Using ChatGPT enhances my effectiveness at school.							
7. I find the ChatGPT to be useful in my learning.							

Variable	SD	MD	SWD	N	SWA	MA	SA
Perceived Ease of Use							
8. My interaction with the ChatGPT is clear and understandable.							
9. Interacting with the ChatGPT does not require a lot of my mental effort.							
10. I find the ChatGPT to be easy to use.							
11. I find it easy to get the ChatGPT to do what I want it to do.							

Variable	SD	MD	SWD	N	SWA	MA	SA
Perceived Enjoyment							
12. I find using ChatGPT to be enjoyable.							
13. The actual process of using ChatGPT is pleasant.							
14. I have fun using ChatGPT.							

Variable	SD	MD	SWD	N	SWA	MA	SA
Job Relevance							
1. Are you in agreement or disagreement that the use of ChatGPT is important to your work?							
2. Are you in agreement or disagreement that the usage of ChatGPT is relevant to your work?							
3. The use of ChatGPT is pertinent to my various teaching and research-related tasks.							