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Developing a Generative AI Conceptual Framework for Higher Education

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Abstract

The overall aim of this research is to develop a whole-of-institution framework that supports the use of generative AI chatbots across higher education institutions (HEIs). The Generative AI Chatbots Acceptance Model (GAICAM) was developed from a blend of models that influence acceptance (TAM, UTAUT2, TPB, and more). optimism, innovativeness, discomfort, insecurity, and others; hence, including variables relevant to GAICAM. It is also critical to analyse and identify the implications for higher education of generative AI Chatbots. A research design was employed based on an integrative literature review and an active analysis of numerous studies from diverse databases, including IEEE, ACM, ScienceDirect, and Google Scholar. Part of the goal was to make sense of the implications for higher education created by AI Chatbots, which also necessitated identifying the prominent considerations relevant to implementation challenges and success. The search criteria were limited to peer-reviewed, English-language publications covering the use of AI chatbots in higher education that were published between 2020 and 2023. The findings demonstrate the degree to which AI chatbots have the capacity to drive improved student engagement, enhance the educational process, and support administrative and research tasks. But there are also clear difficulties, such as unfavorable student sentiments, doubts about the veracity of material produced by AI, and unease and nervousness with new technologies.

A. Introduction

This study examines the developing landscape of generative artificial intelligence (GenAI) chatbots that are evolving quickly in higher education settings, experiencing turbulent technological change. Generative AI chatbots currently in use include ChatGPT, HuggingChat, Google Bard, and many more. Many industries employ AI chatbots, including educational contexts. Acceptance of AI chatbots is still developing, with different paths and challenges to traverse. The potential utility to higher education is significant as they offer personal, low-cost assistance for both lecturers and students in the learning context.

Artificial intelligence (AI) chatbots, in recent years, have been used across disciplines [1]. Generative AI Chatbots such as ChatGPT, HuggingChat, Google Bard, Microsoft Bing AI, Zapier AI Chatbot, and many others are becoming the norm across industries like journalism, content creation, health, finance, the retail sector, and the education sector. The emergence of AI chatbots in higher education (HE) provides opportunities as well as challenges for educators, governing bodies, and policymakers. The potential of AI Chatbots in HE is seen in their ability to assist many students cost-effectively [2, 3]. However, the generative AI chatbots in education are still a shock to many because of their potential to revolutionize the system and provide quick answers to educational questions, explanations, and further viewpoints [4].

GenAI chatbots (AI chatbots) can contribute to learner engagement in HE by delivering personalized support to students in high-level, specialized sessions [5]. Also, generative AI chatbots may help lecturers and students with research (for example, literature review, research methodology), provide reminders about and clarification of homework and organizational aspects, lessen the administrative workload of lecturers, supply feedback to lecturers, and provide feedback to students. Equally, in research conducted by Plovdiv University Paisii Hilendarski, a considerable majority of students acknowledged and had previously employed the educational possibilities presented by the novel AI chatbots [5]. Furthermore, the researchers noted that a majority of them expressed a desire to use AI chatbots. Most were very happy with this innovation. Momonov [2] noted the growing evidence of intent to adopt AI chatbots in HE, but there remains a need for research. AI chatbots in HE are in the very early stages of revolution, with numerous domains yet to adopt them; more research ideas are needed to catalyse this. Then, this study aims to propose a framework for the adoption of AI Chatbots in higher education.

B. Background of the AI chatbots in HE

Chatbots can be regarded as computer algorithms with the ability to understand human intents and imitate human information and conversation [5]. The ability of chatbots involves the provision of personalized, real-time responses to questions and queries. This computer algorithm functions as a result of its ability to learn and re-learn from a large dataset and form new ideas. Recently, the number of AI chatbots has kept increasing, and investment by multinational companies like Amazon Lex, IBM Watson Assistant, Openai, ERNIE Bot, Google Bard, ChatGLM-6B, PanGu-Bot, Yandex (YaLM) Chatbot, Alpaca, BLOOMChat, Microsoft Bing and Edge Chat, ChatGPT Plus, and Vicuna to provide conversational

experiences using machine learning and AI algorithms to mimic human interactions (Iiieva et al., 2023). These AI chatbots are currently used for educational purposes like teaching and learning pedagogy, research, innovations, and non-educational purposes.

According to Ilieva, et al. [5], the late 1960s saw attention from educational institutions invested in chatbots to mimic human interaction for language teaching, then, in the 21st century, there was an increase in conversational AI and the embedding of AI chatbots in conventional electronic learning systems. The AI chatbots as a pedagogical tool have the following features: conversational assistance, multi-modality, multilingual support, cost-effectiveness, integration with other software systems, and data analytics and insights to support lecturers and students' teaching and learning experience [5].

C. The literature review

1. AI Chatbots in higher education: An overview

The advancement of technology in today's world impacts every aspect of human society. The use of virtual assistants (chatbots) is changing the conventional ways of interaction with the computer system. According to Gupta, et al. [6], a chatbot is a software program that uses natural language understanding and processing to communicate with humans through interactive queries. It acts as a virtual assistant that can complete tasks, provide entertainment, and offer business strategy tips. GenAI Chatbots are simulating human cognitive ability and are built on new technologies involving artificial intelligence, machine learning, neural networks, and natural language processing, so the computer software can interpret the user's request and respond. Gupta, et al. [6] classify chatbots by complexity of the technology, algorithms, and interfaces into (at least) three categories:

1. Menu/button-based chatbots: are the most prevalent and least complex. To assist the user in navigating a decision tree and receiving the appropriate AI response, they utilize buttons and menus to observe their choices in a top-down manner. These chatbots cannot be relied on to engage users, as chatbots are often less responsive than expected.
2. Keyword recognition chatbots: These chatbots leverage natural language processing to identify keywords from the users' inquiries and respond to the inquiry based on their recognition. Although keyword recognition chatbots are less structured than menus and decision trees, they can allow for more flexibility and therefore handle a greater variety of queries. However, they may also lack the ability to accurately respond to complex queries or words that are misspelled or unclear.
3. AI/NLP-based chatbots: These chatbots use advanced technologies such as machine learning, neural networks, artificial intelligence, and natural language processing to simulate human-like conversations with users. They can understand complex queries, learn from user interactions, and provide personalized responses. However, they require a large amount of data and training to achieve high accuracy and may be more expensive to develop and maintain. The above classifications are increasingly used in higher education, especially the

AI/NLP-based chatbots such as ChatGPT, Google Bard, and many others, which are revolutionizing the sector.

The use of generative AI chatbots is advancing the interest of lecturers and students in adding value to higher education teaching and learning processes in the following manner: personalized assistance (meeting specific learning needs), independent and self-directed learning, and scholarly resource access (assisting in access to the literature review and research methodologies) [5].

AI chatbot concerns

The application of AI chatbots in higher education is drawing concerns [7]. The biggest concern among scholars is that students will use AI chatbots to cheat and plagiarise their assignments, research, and other academic tasks [7]. Academic cheating has been long time in the history of academics. The act happens at every level of education, from primary to tertiary, involving misconduct [8]. Academic cheating is a violation of academic integrity. Academic integrity is built on five fundamental pillars and values "honesty, trust, fairness, respect, and responsibility" [9]. Academic cheating is regarded as misconduct committed by a student to deceive his or her lecturer into believing that a submitted academic assignment is their own work [10]. The act involves deceiving, tricking, misleading, fooling, or defrauding another intentionally.

Scholars are concerned about ethical issues on the biases of AI-generated text and content. According to Kooli [11], AI chatbots are as biased as the data it was trained on. If the data entered is biased, then quire outcome will be biased, discriminatory, and inequality. Security is another aspect of concern for many because of the concerns that happened on AI chatbots and their storage. However, Hasal, et al. [12] believe that security issue is not a major concern for AI chatbots because many of their security concerns are known and mitigation mechanisms are available.

Theoretical frameworks

Many theoretical frameworks are applied in carrying out information systems (IS) research. The section seeks to understand some existing frameworks that can contribute to the implementation of generative AI chatbots in HE. According to Ilieva, et al. [5], scholars are beginning to explore frameworks and ways to assist the execution of AI chatbots in HE. For example, Rasul, et al. [13], through constructivist learning theory, presented a framework to inform the usage of ChatGPT in universities. Gimpel, et al. [14] provided a step-by-step guide on how lecturers and students can use ChatGPT to improve teaching and learning practice [15]. Chan [7] proposed a framework to address ethical, privacy, security, and accountability issues. Ilieva, et al. [5] proposed a framework to advance the resources offered in teaching and learning in higher education. These proposed frameworks provide different aspects of the application of AI chatbots to positively impact on current teaching and learning process in higher education institutions. However, according to Ilieva, et al. [5], there are drawbacks in frameworks because they failed to address:

a. Syllabus operational issues on knowledge acquisition and skills development.

b. The usability analysis of AI chatbots focused on the AI tool's implications in higher education.

c. The readiness and perception of the students, lecturers, and other stakeholders were neglected, but focused on the classroom process and content provided.

D. Problem statement

AI chatbots have the potential to transform pedagogical activities and reshape the educational landscape [5]. However, the adoption rate of AI chatbots in HE is still low [1]. The adoption of AI chatbots in HE is not without its challenges. One issue is that some students have a negative disposition towards chatbots since they place significant emphasis on in-person collaboration to develop their soft skills [5]. Finally, some students questioned the authenticity of the texts produced by AI chatbots, which can best be verified using AI technologies such as ChatGPT [5].

As scholars continue to investigate the implications of the adoption of AI chatbots in HE Ilieva, et al. [5], the capacity to improve students' learning [2], and the merits and drawbacks [16], the production and publishing of research and literature for AI chatbots in higher education is growing [2]. As the trend towards AI chatbots develops, scholars need to investigate and suggest strategies to enhance the value and use of AI chatbots in higher education.

Ilieva, et al. [5] introduced a theoretical framework to help students engage effectively with generative AI tools in a blended learning process. The framework did not support the adoption of this emerging technology in HE contexts. However, scholars are advancing in their quest to provide a mechanism for making AI chatbot usage in higher education settings. Despite the growing availability of academic research and knowledge, there is a lack of a comprehensive approach that informs the initialization, analysis, design, and implementation of robust adoption of AI chatbots in HE [5]. However, the presence of a comprehensive framework for HEIs in the adoption of generative AI chatbots is missing and limited in the academic published literature at the time of the study. Then, this study combines various components from widely known and lesser-known frameworks used in information systems research and other social science research to propose a comprehensive framework to guide the adoption of generative AI chatbots in HE.

1. Research objectives and questions

The purpose of this study is to provide a framework for the adoption of GenAI chatbots in HE. The framework describes the variables (factors) that will influence HEIs' adoption of AI chatbots. In this study, it was shown that GAICAM is a strong framework that can assist universities in the integral use of generative AI chatbots. The framework provides a balance between technology readiness and user acceptance for addressing the opportunities and limitations of generative AI chatbots in HE contexts. This study contributes to the body of literature on artificial intelligence in education and provides a guideline for educational institutions to introduce generative AI chatbots more systematically.

E. Research methods

There are many different kinds of research methods to research the acceptance of generative AI chatbots in higher education. [5] and Sandu and Gide [3] used surveys of university students; Ou, et al. [17] conducted a post-humanist review with university students in qualitative research; and Momonov [2] used secondary data to review empirical literature studies. This study was made by conducting searches of key online databases related to information systems, social science, and education research: Association for Computing Machinery (ACM) digital library; Institute of Electrical and Electronics Engineers (IEEE); ScienceDirect; Google Scholar; and ResearchGate through an integrative literature review (ILR) method.

1. Terms search

The acceptance of new technology AI chatbots in HE is emerging, and literature is being produced [2]. Chatbots were the main searched item for understanding their application by students, lecturers, and the higher education at large. The study searched terms like “chatbots for higher education”, “AI chatbots effect in higher education”, “AI chatbots framework for higher education”, “AI chatbots use by students”, “AI chatbots usage by lecturers”, and “AI chatbots”.

2. Criteria for inclusion in the study

The articles included in the study are based on 1) written in the English language, 2) peer-reviewed academic materials, 3) empirical studies focusing on the use of AI chatbots in HE, and 4) published between 2020 and 2023. This review study is informed by the following research questions:

1. How can AI chatbots affect HE?
2. What are the frameworks to aid the adoption of generative AI chatbots in HE?
3. What are the components to consider in developing a generative AI chatbot framework for HE?

F. Result and Discussion

1. This AI chatbots usage in HE

The use of AI chatbots in HE is growing. A study found that AI chatbots can be an effective tool for providing quick and accurate responses to student queries, reducing the workload of university staff, and improving student satisfaction [6]. Sandu and Gide [3] also found that AI chatbots enhance communication, productivity, and efficient teaching and learning assistance. The AI chatbots further make higher education students' learning experience customizable, answer their questions and curiosities, and advance their learning abilities and skills [18]. The thinking ability needs and expectations of students and academicians in higher education are improved through AI chatbots in making learning fun and interesting, and in providing access to innovative knowledge and skills.

2. The frameworks to aid the adoption of generative AI chatbots in HE

The use of information systems in addressing social issues and needs keeps growing. The application involves the use of theoretical and conceptual frameworks in the process. According to Chukwuere [19] and Adom, et al. [20], a

theoretical framework is the basis upon which academic ideas are built in addressing research objectives and questions. A conceptual framework is the formation of an idea based on components of theoretical frameworks. Multiple theoretical frameworks are often utilized in IS research. This segment of the research briefly examined the available theoretical frameworks and extracted relevant aspects used to develop the proposed AI chatbots conceptual framework, termed Generative AI Chatbots Acceptance Model (GAICAM), as indicated below.

Theory of Reasoned Action (TRA): TRA, propagated in 1975, is one of the most accepted theories for predicting and understanding human behaviours by Ajzen and Fishbein. TRA indicates that personal attitudes and subjective norms around particular human behaviours in a situation are determinants of the intention of behaviour [21]. TRA has received criticism as a generalised model and also, not considering other meaningful factors that impact individual intention and behaviours [21]. TRA is one of the most popular models to understand the behaviour motives, behavioural intention, and attitudes on actual behaviour action by an individual [22]. In the context of technology acceptance and use, individual behaviour motives and behavioural intention lead to an actual behavioural action toward uptake. TRA explores the link between belief, intention, attitude, and behaviour in the idea that human behaviour has the actions dictated by available consequences [23]. TRA succeeded in addressing the explanation of behavioural intention in a behaviour represented as an action, but leaves out some underlying factors where the action occurs, such as innovations, cost, and many more.

Theory of Planned Behaviour (TPB): TPB was developed in 1991 by Ajzen as an extension of the TRA (Theory of Reasoned Action), and includes the construct of perceived behavioural control. TPB proposes that an individual's attitudes towards the behaviour, subjective norm, and their perceived behavioural control will affect their behavioural intention. TPB is commonly used to predict and understand human behaviour in many different contexts [21].

The theory discovers the conditions that trigger an individual’s behavioural intention toward attitude. The Theory of Planned Behaviour (TPB) is a very prominent theoretical framework that describes and predicts human behaviour. It constructs meaning through three principal factors - an attitude toward the behaviour, subjective norms, and perceived behavioural control - that create his or her intention towards doing a behaviour. Subjective norms articulate an individual’s sense of obligation towards doing the behaviour, attitudes represent the way an individual views the behaviour, and perceived behavioural control articulates the individual's sense of ease or difficulty they perceive can conducting the behaviour. TPB is employed across diverse contexts and is a solid predictor of people's intention to adopt and use technology.

Technology Readiness Index (TRI 2.0): is an alterations of the technology readiness index (TRI 1.0) to provide its enabling factors that establishes an individual’s mindset to acceptance of new technology to complete a personal or organizational task [24, 25]. On TRI 2.0, optimism and innovativeness are the enablers/contributors to technology readiness, with discomfort and insecurity the inhibitors to technology readiness [24, 25]. For example, individuals with a high technology readiness index regard the benefits of technology, which define their behaviour towards it.

Technology Acceptance Model (TAM): The Technology Adoption Model (TAM), which was developed by Davis et al. in 1989, asserts that two particular beliefs "perceived usefulness" and "perceived ease of use" are the major drivers for the actual behaviour of technology adoption from the perspective of the individual [26]. The TAM is a theoretical framework that investigates and describes variables that impact the acceptance of information technology with the purpose of being able to predict and explain acceptance [27]. Many researchers have performed and extended the work of the TAM model, which is a reliable, validated, and established model [21].

It is a conceptual model to investigate if the artifacts of information systems will be employed by individuals voluntarily [24]. The model incorporates "perceived usefulness (PU)", along with "perceived ease of use (PEU)", "attitude towards using (ATU)", and the behavioural intention of the individual and organisation as factors that impact the acceptance of information systems in practice. Instances of the study described TAM as a conceptual model that illustrates how humans accept and then use new technology. TAM was first published by Fred Davis in 1989, and the application of it, and its acceptability, in information systems research has been widely accepted. TAM included perceived usefulness and perceived ease of use as the two most salient factors to shape a consumer's attitude toward technology. Perceived usefulness (PU) is the degree to which users think that by using the technology, he or she can perform his or her jobs better, and perceived ease of use (PEU) is the degree to which users believe the technology is easy to use. In TAM, it identifies that these two variables impact a user's intention to use technology, and are then factors that impact usage behaviour.

TAM also suggests that users' attitudes toward the use of computer technology may be influenced by external variables that influence perceptions of usefulness and ease of use (for example, facilitating conditions, social influence). TAM has been applied extensively in information systems research to examine the acceptance and use of various technologies and has provided a framework to understand the process of how users come to accept and use new technologies.

Unified Theory of Acceptance and Use of Technology (UTAUT): The Unified Theory of Acceptance and Use of Technology (UTAUT) is a comprehensive framework created to understand and ultimately answer questions surrounding people's trust of technology and behaviours surrounding its use. Developed by Venkatesh et al in 2003, UTAUT synthesises concepts of eight established technology acceptance theories and models (for example, Technology Acceptance Model (TAM); Motivational Model (MM); Theory of Reasoned Action (TRA). UTAUT's four constructs are actual determinants of technology acceptance and use: performance expectancy (for example, the extent to which a person believes that using technology will elevate their ability to do a job); effort expectancy (iperceived ease of use) [28]; social influence (a person's decision to use technology is impacted by social factors); and facilitating conditions, which refers to the perceived degree that usage is supported by organizational and technical infrastructure.

Other notable aspects of UTAUT are its inclusion of moderator variables, where items such as education level, gender, experience, and volitional behaviour

may act to moderate the relationship between the core constructs and technology acceptance. In general, UTAUT is a well-researched, comprehensive model to help set up context to understand the elements that influence the technology acceptance and use of technology by individuals, and was designed to be applied in technology acceptance research contexts to research technology acceptance and use in various contexts.

The **Motivational Model (MM)** would aim to extend the understanding of individuals' motivations to use technologies and to explain the factors affecting the motivations of individuals that would affect their adoption of new technology. The MM was introduced in 2000 by Venkatesh. The MM consists of three constructs: intrinsic motivation, extrinsic motivation, and self-efficacy. The MM has been applied in various studies in which researchers used the MM to predict and understand people's motivations to use new technologies [21]. This model, developed by Davis in 1992, actually emphasizes three constructs or aspects that influence people's motivation to use technology: self-efficacy, extrinsic incentive, and intrinsic motivation. Extrinsic motivation is anything that is externally generated, such as incentives or peer pressure; intrinsic motivation is the motivation to use technology that an individual has developed internally. Self-efficacy is the measure of the individual's belief that they can appropriately use a technology.

The MM has been helpful for the study in providing a deeper understanding of the reasons individuals use and then adopt technology, leading ultimately to the study of the motivations of technology users and the adoption of technology.

Unified Theory of Acceptance and Use of Technology 2 (UTAUT2): UTAUT2 is an extension of UTAUT, developed by Venkatesh et al. in 2012, and has the capability to predict usage intention behaviour 74% of the time. UTAUT2 has nine models of IT acceptance. UTAUT2 is a dynamic and wide-ranging theoretical model developed by a group of researchers, which allows us to understand the measurements of people's acceptance and rejection behaviours towards new technologies and will comprise other potential behaviours influenced by relevant domain factors, including cultural, social, and technological factors and behaviours [21].

Revised Technology Acceptance Model (RTAM): The TAM modified in this study aims to encapsulate and show the cultural factors that shape human preferences in a variety of social approaches/dispositions, including developing and emerging economies. Viewing that technology is used and being deployed in an environment surrounded by socio-cultural, socio-economic, and political factors, the model seeks to build a reflexive system based on the individual choices and social and cultural values [22].

The five layers of the modified TAM serve to separate/model the five layers into separate but interrelated layers. The first layer is made up of enablers that define user attitudes, practices, and cultures towards technology in middle-class and developing countries. The perceptions mentioned in the original TAM and other factors missing from current theories, models, and frameworks that specify the contextual factors leading to the specific characteristics that inhibit technology adoption in developing and emerging countries constitute the second layer that

deals with things like infrastructure, belief systems, real usage, behaviour, attitude, perception, and culture/tradition.

The model highlights how Social, Economic, and Political (SEP) aspects play a major role in determining how technology is adopted in developing and rising nations. It acknowledges that people's views and behaviours about the adoption of technology are greatly influenced by sociological, cultural, political, and economic factors. With a focus on developing and emerging nations in particular, the updated TAM seeks to offer a more thorough framework for comprehending and encouraging technology adoption in a variety of social circumstances.

3. The components to consider in developing an AI Chatbot framework for higher education

The Generative AI Chatbots Acceptance Model (GAICAM), Figure 1, is composed of different framework components such as TAM, TRI 2.0, UTAUT2, revised TAM, and TPB.

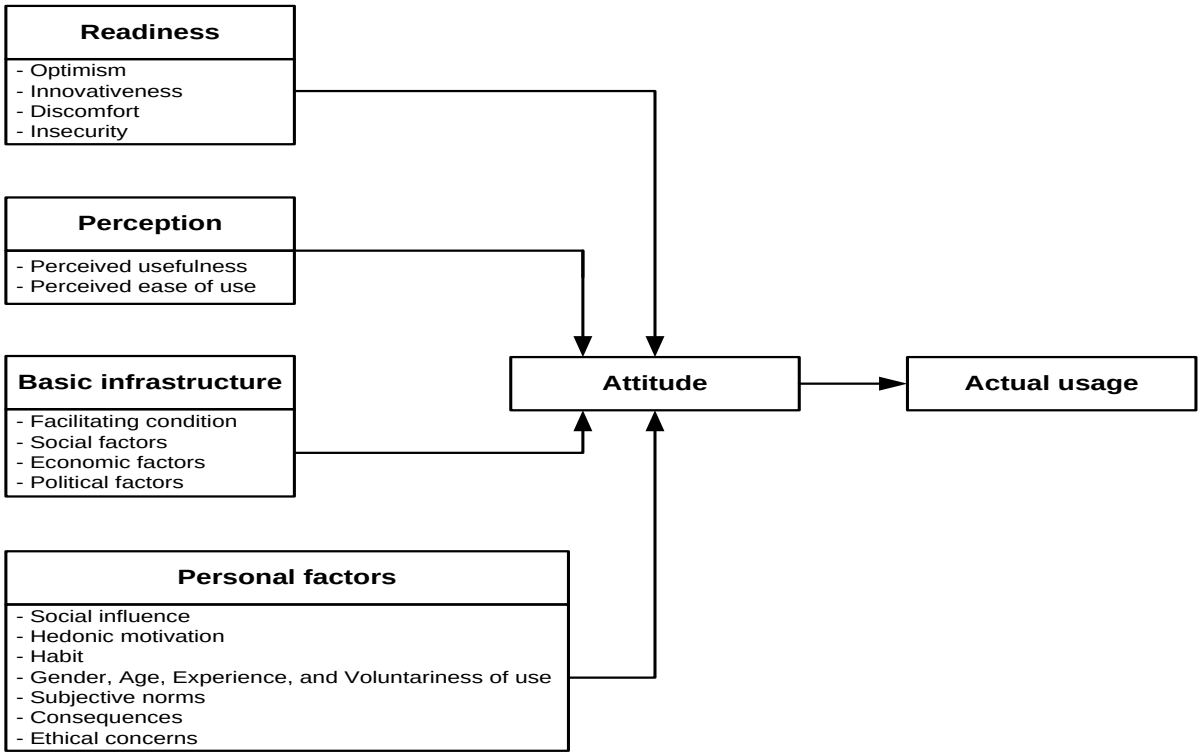

Figure 1: Generative AI Chatbots Acceptance Model (GAICAM)

a. Readiness

Readiness provides the aspect of the user's willingness to adopt technology and generative AI chatbots in particular. The readiness outlined and discussed the components that enable the propensity to use generative AI chatbots in higher education.

Optimism: It provides individuals "positive view" towards increasing life and work efficiency [24, 25]. Through optimism, technology users have total control of the new technology with the belief that it adds value to their tasks. For example,

optimist users will likely use the new technology more often to achieve basic tasks and functions. In this study, optimism is a positive view about AI chatbots with the belief that they will offer increased control, flexibility, and efficiency in daily academic and non-academic tasks. In the context of AI chatbots in HE, optimism would manifest as a positive belief in the potential of AI chatbots to improve the learning outcome and experience. This includes the perception that generative AI chatbots can provide personalized support, improve accessibility to educational resources, and contribute to a more efficient and effective learning process. The study believes that optimism reflects a positive outlook on the potential benefits of generative AI chatbot technology in facilitating the process of teaching and learning, and research.

Innovativeness: Innovation, as defined by Ntseme [24] and [25] is the extent one perceives him/herself as being a thought leader in technology by trying out new technology. In the case of an AI chatbot, anyone can close it as new technology utilizes the innovations made in the chatbot's design to conceptually remedy the reason they tried the new technology. Innovation in the definition described by Parasuraman [25] is the characteristic of an individual who is in their mind, is a thought leader, and a pioneer in technology adoption. This trait encompasses a willingness to explore and adopt technology-based products and services, positioning the individual as a leader in technological advancements. Tsikriktsis [29] further emphasizes that innovativeness looks at the extent to which people believe they are at the forefront of trying out new technology, demonstrating a proactive and forward-thinking approach. Son and Han [30] also note that highly innovative individuals feel comfortable with technology and require less proof of its outcomes, showcasing a readiness to embrace and lead in the adoption of new technologies.

For example, for a GenAI chatbot to appeal to students, lecturers, and other stakeholders, it must be innovative, which drives confidence towards acceptance and usage. In this study, innovativeness is regarded as one's ability to accept a generative AI chatbot based on its innovativeness to positively impact their academic and non-academic lives. Innovativeness in the context of generative AI chatbots in HE would involve a willingness to embrace and explore the potential of generative AI chatbots as educational tools. This includes being open to experimenting with new AI-driven learning methods, actively seeking out opportunities to integrate generative AI chatbots into educational practices, and being among the first to adopt and advocate for their use in educational settings. Innovativeness, according to this study, pertains to the willingness of the educational stakeholders to explore and adopt new AI technological advancements. For the application of AI chatbots in education, innovativeness would manifest as a tendency among students and lecturers to actively explore and champion the integration of generative AI chatbots as valuable educational tools, driving innovation and progress in educational practices.

Discomfort: This indicates that people feel that they do not have the ability to oversee new technology [24, 25]. They perceive new technology to be too heavy and distrustful. This situation applies to the discomfort of the application of generative AI chatbots in the higher education context, such discomfort individuals take it for granted and will not regard it as important, as they regard the

technology as too heavy and heavy to understand. Discomfort is produced by negative beliefs and perceptions of technology. For this study, discomfort is a negative feeling toward generative AI chatbots because they feel that it is heavy or they lack control over using them in their academics. For generative AI chatbot to be accepted in higher education context, discomfort as a condition must be an issue that is addressed to support acceptance. For some, discomfort might arise because of issues related to the use of generative AI chatbots in HE, such as job displacement for educators, ethical issues associated with data privacy and security, or the potential disruption of their traditional teaching methods. Discomfort can be resolved by allowing for concerns to be heard and addressed, having transparent communication, ethical frameworks for the implementation of Generative AI chatbots in HE, and creating means of professional development for educators. Discomfort captures unease and questions and issues regarding the introduction of new information communication technologies, in the case of a generative AI chatbot in HE.

Insecurity: Insecurity is the uncertainty, including doubt or distrust, for technology adoption that fosters doubt and scepticism about the reliability and security of new technology, such as concerns about malfunctions, data privacy, and security issues, and trust that technology will fulfill the intended purposes. According to Parasuraman [25], insecurity is a major setback to technology readiness because it causes individuals to doubt whether technology is trustworthy in meeting their needs. Moreover, Tsikriktsis [29] demonstrates that insecurity is connected to discomfort but focuses specifically on uncertainties with respect to the functionality and trustworthiness of technology. Tackling insecurity must involve instilling trust and belief for the adoption of new technologies, as well as making him feel secure with technology interaction and comfortable in his ability to benefit from technology [24].

This study suggests that insecurity is related to uncertainties about technologies reliability and security. In the context of generative AI chatbots in HE, this insecurity may refer to uncertainties with respect to the accuracy and effectiveness of generative AI chatbots in practice for learning and learning outcomes; in particular, doubts about the accuracy of AI-generated educational content, biases from AI algorithms, and overall trust in AI chatbots. Insecurity can be addressed by being transparent about generative AI chatbots, providing evidence on their educational benefits, and possibilities for addressing bias and error.

b. Perception

The acceptance and use of any technology rests on the way a user perceives the possible benefits they could achieve from the technology; hence, perceptions of the GAICAM are defined by the factors delineated here.

Perceived usefulness: The degree to which an individual believes that use of a particular technology will enhance their ability to perform their work is perceived usefulness. It reflects the user's subjective likelihood of using the system as beneficial, making it an important determinant of an individual's willingness to use technology [21]. A user's subjective likelihood of using a certain technology or system to perform their work better is their perceived utility (PU) [31]. PU

represents students', lecturers', institution management, and other stakeholders' beliefs about how much AI chatbots can enhance their academic performance. Students and other stakeholders would utilize generative AI chatbots for learning if they consider it a viable tool for effective information search, idea exploration, learning, quick access to learning and research content, exchanging information, interacting with colleagues, and enhancing their learning outcomes.

Perceived ease of use (PEOU): Perceived ease of use is the extent to which a person believes using a particular technology would be free of effort. PEOU is, for example, the extent to which a user believes a technology or system will be easy to use [31]. This section discusses how easy it is for a user to use the system, as well as how easy they think it is to use. PEOU and PU are important in the TAM (Technology Acceptance Model) because they have important roles in determining users' attitudes to and behaviours with the adoption of new technologies [21]. Overall, PEOU and PU are important influences on students', lecturers', managers of institutions, stakeholders, and members of an institution's understanding of the use of generative AI chatbots for teaching, learning, and research. Understandably, these implications need to be incorporated into considerations of change or functionality before implementing initiatives that intend to use generative AI chatbots in higher education.

c. Basic infrastructure

The basic infrastructure provides the basic resources that facilitate the use of generative AI chatbots in higher education. The infrastructure involves facilitating conditions, and economic and political factors.

Facilitating conditions: The user's impression of the tools and assistance available to act is referred to in this dimension. It reflects the user's perception of the system's compatibility with its existing infrastructure and the availability of technical support [21]. These are objective factors like external factors to individuals as an enabler towards acceptance and non-acceptance of technology [32]. Marikyan and Papagiannidis [33] define this dimension as the extent to which a person has access to the tools and assistance required to use a certain technology efficiently. It influences the actual utilization of technology and is an important factor in the UTAUT model [28]. As a dimension that focuses on resource perception, then, the adoption of generative AI chatbots in HE is centered on the available resources, such as technical and non-technical resources. Lecturers, institutions, and other stakeholders should make resources to aid the adoption of generative AI chatbots in higher education.

Social factors: Social factors encompass the societal and cultural influences that shape individuals' attitudes and behaviors towards technology adoption. The factors underscore the relevant determinants in processes of acceptance of technology, especially in developing and emerging nations. Chukwuere, et al. [22] report that society and the natural changes in the environment influence how people adopt technology. Culture regarding its properties also guides societal factors in these countries. Hence, understanding social dynamics and cultural norms might help understand patterns of generative AI chatbot adoption.

Economic factors: Economic factors, as defined in the literature, are financial concerns that primarily affect people's reasoning about the adoption of

technology regarding either financial costs or values. In literature, economic factors are more than price impacts on whether people can afford to acquire new technology [22]. The authors have positioned financial crises distance between people from disposable income; this will affect adoption and variance in willingness to adopt new technologies. Financial limits and constraints are major determinants in the adoption and use of generative AI chatbots in higher education within underdeveloped and emerging nations.

Political factors: Political factors, broadly termed, are laws, regulations, and performance of other acts of the government that affect whether technology is adopted in any community [22]. It is important to remember that policy and governments play a vital role in creating an environment conducive to adoption, use, and total value for applications of technology for both social and economic benefits. It is evident that regulations and laws will affect related developments across sectors and regions, and how technology is adopted. The current study emphasizes the role of good governance in the development of an enabling atmosphere for the exploration of technology and the adoption of generative AI chatbots in higher education.

d. Personal elements

Personal elements represent the direct and indirect attributes that can determine whether generative AI chatbots are accepted in higher education.

Social influence: This construct relates to the extent to which users perceive that important others (like family and friends) believe they should use a specific technology. This refers to the user's perception of the system's social norms and other people's influence on their decision to use technology [21]. While Maruping, et al. [32] write that social influence relates to the perception of others on the use of the technology, the construct refers to the extent to which one is affected by the beliefs and behaviours of others. This can include both peers and superiors. This study established that students', lecturers', and other institutions' perspectives and opinions influence the use of generative AI chatbots in HE. The more individuals who adopt the technology for educational purposes, seems to have an effect on a growing number of others. This construct is one of four that represent the UTAUT model, and are of relevance to moderating intention to use technology in higher education [28].

Hedonic motivation: the aspect relating to the enjoyment or fun of using technology has proven to be an important dimension in relation to acceptance and usage. it refers to the enjoyment of using the system, as well as the emotional experience of the user [21]. According to Venkatesh et al. (2016), UTAUT considers the concept of hedonic motivation, which refers to the extent to which a person finds pleasure or fun when using technology. Hedonic motivation has emerged as an important variable in considering adoption and use of technology, and is a strong predictor of both [34]. The concept of hedonic motivation contends that individuals will use technology for more than just the functional outcomes of the choice, but also for the happiness and enjoyment of the engagement. This concept is especially important when it comes to educational technology since the perceived hedonic character of the result (like perceived enjoyment) is a strong predictor of using technology to support learning.

Habit: This element describes the degree to which learning causes people to do behaviours automatically. It displays the degree to which technology has gotten ingrained in the user's everyday life and how frequently they utilise it [21]. Many in the educational institution are becoming technology savvy in aiding academic and non-academic purposes. Then, the habitual use of technology in higher education is influential in the adoption of generative AI chatbots in HE.

Gender, Age, Experience, and Voluntariness of use: These are moderating variables that influence the relationship between the components of UTAUT2 and technology acceptance behavior. They reflect the user's demographic characteristics and the extent to which they have a choice in using the technology [21]. This factor moderates social influence [32]. This implies that the ability of anyone (students, lecturers, and other institutions) to adopt generative AI chatbots is influenced by the views and opinions of others surrounding them.

Subjective norms: Subjective norms are a UTAUT concept that describes the felt social pressure to participate in a specific behaviour, in this example, using technology [33]. It represents a person's opinion on whether or not influential people believe they ought to utilise the technology. Since subjective norms reflect the impact of social circumstances on an individual's desire to use technology, they are a crucial concept in understanding technological acceptability and the usage of generative AI chatbots in higher education. This component refers to the social pressure that individuals perceive from significant others to perform or not perform a behavior [21]. It reflects the individual's perceptual experience of the social norms surrounding the behavior and the extent to which they feel obligated to conform to these norms.

Subjective norms are part of the social influence construct; other components of social influence also related to subjective norms include social factors and image. Research indicates that the effect of subjective norms used to facilitate technology acceptance is moderated by gender, suggesting that the effects of social pressure influencing technology use will vary depending on gender differences. Understanding subjective norms is important for lecturers, educational institutions, and other stakeholders, as understanding subjective norms highlights the role of social influence in students' attitudes and intentions towards generative AI chatbot adoption. Once educational institutions acknowledge the significance of subjective norms, higher education institutions can take necessary initiatives to exploit the social influence towards generating positive attitudes towards generative AI chatbot usage.

Consequences: This component refers to the outcomes that people might perceive are generated through technology. It is a reflection of the person's beliefs about the benefits and costs of the actual use of technology and the value attributed to these outcomes. Although UTAUT does not identify outcomes specifically as a main construct, it does implicitly acknowledge the potential outcomes of technology adoption and use. The construct recognizes that people's beliefs about performance expectancy, effort expectancy, social influences, and facilitating conditions can influence their technology acceptance and use, and those beliefs lead to outcomes (positive and negative) when engaging in technology use.

The outcomes of generative AI chatbot adoption and use, such as productivity, empirical access to academic resources, communication and

coordination, isolation, addiction, and privacy, can be construed as outcomes of the predictors considered in UTAUT. For instance, if students, lecturers, and others perceive high performance expectancy and low effort expectancy from employing particular generative AI chatbots in higher education, then they are more likely to adopt the generative AI chatbot, which perhaps outcomes including productivity. However, if social influence is a significant influencer of generative AI chatbot acceptance in higher education, the outcomes or consequences may include social influence for stakeholders to adopt the technology, with positive/negative consequences. By understanding this factor, higher education institutions and researchers can gain insights into the potential outcomes of generative AI chatbots' adoption and use, and develop strategies to promote positive consequences and mitigate negative ones.

Ethical concerns: The integration of generative AI chatbots in education presents a myriad of ethical concerns that necessitate careful consideration. A major ethical concern is data privacy and security because AI chatbots can store and collect sensitive information, which raises fundamental questions about their obligations to protect and keep this information confidential [35, 36]. It is vital that educational providers/public entities are compliant with data protection legislation and have procedures in place to protect sensitive data from unintentional disclosure or misuse. Similarly, the risk of algorithmic bias represents a significant ethical concern related to generative AI chatbots, as these systems can unintentionally reproduce societal bias found in the training data and result in unfair treatment(s) or discrimination in educational encounters [35].

An important ethical issue lies with the idea of plagiarism because the AI generated by chatbots promotes the passive consumption of work that may tempt a student or scholar into presenting it as their own. This would violate their behaviours of academic integrity and pose a threat to devaluing the educational process [35, 37, 38]. In regard to plagiarism, solving this issue should include the use of plagiarism detection systems, the implementation of academic honesty policies, and the development of new assessment approaches that will limit the use of unethical considerations. While an overarching set of possibilities exists to tackle these ethical debates, the intent here is to promote a values-based commitment to ethics among educators, policy-makers, and students. This will enable them to explore and exploit the potential of chatbots in educational settings while affirming ethical standards in delivering educational experiences that are both safe and inclusive for everyone [35, 39].

e. Attitude

This element refers to individuals' evaluation of behaviour, either positive or negative. It is indicative of the individuals' views about the outcome of the behaviour and the extent to which it is valued [21]. The study conducted by Amadu, et al. [31] established that the "attitude" element of the TAM significantly shapes the behavioural intention of students to use social media for collaborative learning. TAM describes two key elements which influence attitude of perceived utility (PU) and perceived ease of use (PEOU) [31]. Based on the study, if students believe that generative AI chatbots are user-friendly and increase their academic performance, they will have a positive attitude toward using generative AI

chatbots for academic purposes such as conducting research and completing assignments for their classes.

Attitude is a mediating factor that plays a significant role in both students' and lecturers' aspirations to use generative AI chatbots for academic learning. This means student attitudes towards generative AI chatbots in terms of ease of use and utility highly influence their intention to engage in collaborative learning activities using generative AI chatbots. Therefore, the study highlighted the need to consider the attitudes of students, lecturers, and other stakeholders toward generative AI chatbots as part of the effort to encourage use for academic (learning) purposes. Higher education institutions would want to create favourable student attitudes towards the ease of use and utility of generative AI chatbots as a way to positively affect their attitudes and ultimately their intention to use generative AI chatbots as learning tools.

f. Actual Usage

Actual usage refers to the actual use and application of a technology or a system by people in their daily lives. Regarding theoretical models such as the Model of Personal Computer Utilization (MPCU), actual usage refers to the observable behavior by which individuals utilize technology for their academic or personal tasks. Actual usage is a main aspect of understanding the validity of this conceptual model, explaining or predicting generative AI chatbots' acceptance and adoption in higher education. Additionally, it highlights the way students, lecturers, and other higher ed stakeholders use generative AI chatbots in real-world settings by helping to contextualize the factors or interrelated components of generative AI chatbots' initial acceptance and continued usage.

In this study, examining actual usage allows researchers, students, lecturers, and other higher education stakeholders to see the long-term influences of constructs such as attitudes on continued involvement with generative AI chatbots. By investigating actual usage, higher education stakeholders would be able to assess the predictive power and relative validity of the conceptual model in capturing the nuances of human-technology interactions. Furthermore, as future research could provide insight into how students and lecturers are applying generative AI chatbots to their daily academic practices, higher ed institutions will be able to adjust their strategies to improve user experience, productivity, and satisfaction.

G. Recommendations and future study

The practical implications from the study on the adoption of generative AI chatbots in HE include:

1. Developing a comprehensive framework: The study proposes the establishment of a theoretical conceptual framework for the use of generative AI chatbots in HI. The Generative AI Chatbots Acceptance Model (GAICAM) is suggested as a framework that encompasses elements of existing theories, such as TAM, TRI 2.0, UTAUT2, revised TAM, and TPB, to explain the acceptance of generative AI chatbots in HE.

2. Concerned critical elements: the study highlights the need for a way to concerned critical elements such as readiness, perception, basic infrastructure,

individual factors, attitudes, and actual use to have a better adoption process. It also emphasises the role of innovativeness and optimism in developing initial acceptance and support of AI chatbots in a learning posture.

3. Examining the impact of AI chatbots on student learning outcomes: research in the study indicates that future research should explore the impact of AI chatbots on student learning outcomes over time. To this, future research can consider researching generative AI chatbots with respect to increasing student engagement, academic performance, and retention rates.

4. Investigating the role of AI chatbots in supporting academic and research purposes: Based on the study, researchers can investigate the role of generative AI chatbots in supporting academic and research purposes. Potential areas of further investigation can include researching the use of generative AI chatbots to support faculty in doing research, improving efficiencies for administrative purposes, and providing personalized academic support for students.

5. Investigating cultural and contextual factors: The study in the research indicates that future research should investigate cultural and contextual factors that may influence the acceptance of AI chatbots in educational contexts. An example of some potential areas of research can be how cultural norms, values, and beliefs may influence the acceptance and use of generative AI chatbots in particular regions and countries.

The proposed future studies based on the recommendations include:

1. Long-term impact studies: Studies that would further explore the long-term impact of the use of generative AI chatbots on student learning outcomes, which include performance, engagement, retention, and research.

2. AI chatbots support academic endeavors: Studies that will address the ways generative AI chatbots can support faculty in their research, free up time for administrative tasks, and provide student-specific academic support.

3. Impact of culture/context in HE: Research that examines the impact of culture and contextual factors on the acceptance and use of generative AI chatbots in various educational contexts.

These recommendations and proposed future studies provide a significant contribution to existing knowledge for researchers and educational organizations to help them better understand how to sustainably and meaningfully integrate generative AI chatbots in higher education.

H. Contributions of the Study

The study will greatly expand the body of research on the use of generative AI chatbots in HE. First, the paper provides a comprehensive framework for the deployment of artificial intelligence chatbots by HEIs. By integrating elements of widely known frameworks, including the TAM, UTAUT2, revised TAM, and the TPB, into a framework that incorporates variables of optimism, innovativeness, discomfort, insecurity, and many other variables, the study provides a roadmap to implement AI chatbots in educational settings. This framework is organized around considerations of user attitudes and technological readiness, and includes important components of readiness, perception, rudimentary infrastructure, personal factors, attitude, and behaviour in practice. So, the framework from this

study provides a roadmap for institutions in higher education to implement generative AI chatbots effectively.

Second, the research identifies key factors contributing to the potential adoption of generative AI chatbots in higher education institutions (HEIs). By examining the potentialities and limitations of generative AI chatbots in higher education (HE), the research focuses on identifying key factors such as technical readiness, attitudes towards users, innovation, and optimism. This identification of key factors provides an enlightening insight into the challenges and opportunities that may come with the adoption of generative AI chatbots into educational settings, while allowing a continued examination of the interactions entailed in adopting generative AI chatbots within higher education. Additionally, the research explores additional factors related to generative AI chatbots in higher education, noting improvements in student engagement, administrative efficiency, and bespoke academic assistance. This exploration of potential further strengthens the argument for generative AI chatbots to be adopted in education. The identification of potential advantages could strengthen the developing body of research around generative AI chatbots in HE, particularly in terms of improving learning conditions for both lecturers and students.

Finally, the research posits several directions for future research, including the effect of generative AI chatbots' experience on student learning and learning outcomes, the function of generative AI chatbots in the context of research and academic support, and exploring the cultural and contextual issues affecting the uptake of generative AI chatbots in a diversity of education environments.

The article provides a useful reference point for researchers, allowing them to determine future research paths that will allow them to explore the use and impact of generative AI chatbots in educational contexts. In identifying future research directions, the paper provides a means to inform researchers and practitioners to continue to explore the use of generative AI chatbots in higher education, thus contributing to the academic community in this emerging field.

I. Study limitation

This Although the research on the use of generative AI chatbots in HE provides valuable insight, there are limitations:

1. Limited timeframe: The research focuses on peer-reviewed publications in English from 2020-2023 and, as a result, may not capture a wider range of studies from before or after this period.

2. Limited focus: Research focuses on generative AI chatbots in HE institutions and does not consider educational contexts in K-12 or vocational training settings.

3. Limited geographical scope: The research focuses on studies in English-speaking countries and consequently limits generalizability to other contexts and countries.

4. Limited methodological scope: Research relies on a literature review and analysis of peer-reviewed publications in databases such as IEEE, ACM, ScienceDirect, and Google Scholar. However, peer-reviewed publications never capture studies using other methods (for example, case studies, ethnographic).

5. Small sample size: One potential limitation that the research is the lack of information regarding the sample sizes of the research studies we analyzed. This limits the extent to which the findings of this research could be generalized.

The paper provides important insights into the adoption of generative AI chatbots in higher education; the limitations should be considered when interpreting findings. Future research should seek to overcome these limitations to achieve a more thorough understanding of the adoption and impact of generative AI chatbots in educational environments.

J. Conclusion

The current paper presents the Generative AI Chatbots Acceptance Model (GAICAM), which builds on construct from existing models such as the Technology Acceptance Model (TAM), the Technology Readiness Index (TRI 2.0), The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), the Revised Technology Acceptance Model (TAM), and the Technology Acceptance Model (TAM) to develop an understanding of acceptance of AI chatbots in higher education. The authors recognize the increasing interest and promise that AI chatbots can bring to changes in education, particularly in higher education, where the chatbots can provide individualized support, contribute to research, and enhance the quality of the learning process.

At the core of the GAICAM are six major components that will impact the acceptability and incorporation of artificial intelligence (AI) chatbots in higher education contexts: readiness, perception, generic infrastructure, personal factors, attitude, and actual use. The study emphasized the importance of addressing these components if we are to promote a less disruptive acceptance of AI technologies. For example, to be considered an adoptee of generative AI bot technologies, innovativeness and optimism, meaning having a positive orientation with life and being generally receptive to new technology, are key for first-level acceptance and implementation of generative AI chatbot implementations in education.

In contrast, uneasiness and distrust represent challenges or barriers to adoption, hence the need to overcome concerns about the complexity, dependability, and security of generative AI chatbots. The research methodology offers a strong foundation for the framework, consisting of a comprehensive review of the relevant literature and empirical studies. The findings of the study indicate that both students and educators are growing increasingly cognizant of and interested in AI chatbots, but the findings also signify the obstacles that must be overcome before adoption. The GAICAM framework provides higher education institutes with a systematic approach to dealing with the challenges associated with the integration of generative AI chatbots. This framework aims to enable broader and successful integration of generative AI chatbots in higher education, ultimately enhancing the learning process and products by considering factors that affect user adoption and addressing obstacles. The study suggests that we must continue to research and be responsive to this burgeoning field to ensure that generative AI is adopted as effectively and efficiently as possible in educational environments.

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