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RESEARCH ARTICLE

Decision-Making Framework for the Utilization of Generative Artificial Intelligence in Education: A Case Study of ChatGPT

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ABSTRACT The increasing integration of ChatGPT, a Generative Artificial Intelligence (Gen-AI) model, into educational environments has sparked substantial ethical concerns. This paper addresses the crucial question of whether to impose restrictions or legislate the usage of Gen-AI, with ChatGPT as a pivotal case study. Through systematic literature review and frequency of occurrence analysis, 10 ethical concerns were selected for further analysis using the Analytic Hierarchy Process (AHP). The analysis responses of 10 expert panels show that the top concerns, as revealed by their weights, after meeting the consistency requirement, include copyright, legal, and compliance issues (0.1731), privacy and confidentiality (0.1286), academic integrity (0.1206), incorrect reference and citation practices (0.1111), and safety and security concerns (0.1050). Evaluating the impact of these concerns on the policy alternatives (restriction and legislation), the findings revealed that ''Restriction'' received a higher weight (0.513712) compared to ''Legislation'' (0.485887). Notably, copyright, legal, and compliance issues, privacy and confidentiality, and academic integrity emerged as crucial factors influencing the decision between restriction and legislation. This study offers valuable insights for educational institutions and policymakers, suggesting the need for inclusive discussions, pilot programs to assess impacts on critical thinking, development of clear guidelines, flexible regulatory frameworks, awareness campaigns, and potential strategies for ethical and responsible use.

INDEX TERMS ChatGPT, decision making, AHP, ethical concerns, restriction, legislation.

I. INTRODUCTION

In recent years, the integration of Artificial Intelligence (AI) technologies within the educational sector has surged, as evidenced by seminal existing studies [1], [2], [3], [4]. The evolution of AI can be traced to traditional computer-based systems to sophisticated web-based platforms and humanoid robots, revolutionizing administrative efficiency and personalized learning experiences [2], contributing and inspiring the notion of a ''Smart Campus'' paradigm [5]. The hierarchical implementation of AI in education shows the intricate interplay between system development, extraction techniques, and

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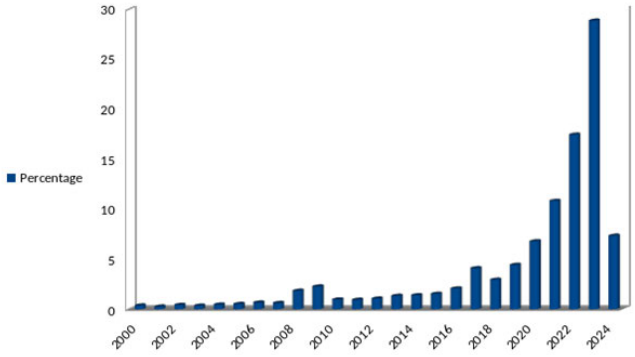

FIGURE 1. Exponential growth trajectory of journal articles on AI and Education from 2000 to 2024. source: Scopus.

application domains, which provides a clear indication of how AI technologies are reshaping educational paradigms across different levels [3]. The AI systems impacted educational practices, encompassing administrative tasks, instructional methodologies, and learning experiences [2]. These systems offer myriad benefits and applications across various areas of education such as stimulating conversations and increasing learners' interest and engagement [1]. One particular example of such tools can be observed in the potential of Chatbot, known as ChatGPT, an AI-based language model, which is revolutionizing educational practices [4], contributing to academic progress by fostering new knowledge, thoughts, and ideas, as well as facilitating academic misconduct, such as plagiarism and inaccurate information [6]. Remarkably, interest in AI within educational practices is growing. Figure 1 illustrates the exponential growth trajectory of research documents on this subject, providing a visual representation of the escalating scholarly interest in AI's role within educational contexts.[1]

Notably, several major disciplines, including law, medicine, and business, are reckoning with what ChatGPT and other Large Language Models (LLMs) mean for them [7]. Chatbots are used in decision support [8], [9], [10], [11] and are recognized as beneficial in diverse healthcare aspects, including medical decision-making [12]. Some studies focus on how decisions are made by these types of Chatbot tools by understanding if their decisions are trustworthy and ethically justified to users [13]. Despite these advancements, critical questions remain unanswered: What constitutes an explanation of the AI decision-making process? What legal, societal, and moral repercussions accompany these decisions and actions? How much leeway should be granted to AI systems in making decisions for humans? [14], [15]. Can we allow Gen-AI such as ChatGPT usage in society, particularly in educational environments? [16], [17], [18], [19]. Hence, the primary research focus of contemporary societies and institutions is directed towards addressing these questions, coupled with underlying concerns, to formulate policies that bear moral implications for society.

[1]The exponential growth trajectory of research documents was obtained on 01 March 2024, by utilizing the Scopus database and employing the keywords "AI" and "Education" from 2000 to 2024.

A. ETHICAL CONSIDERATIONS IN AI INTEGRATION IN EDUCATION

In the ever-evolving landscape of AI, generative AI technologies like ChatGPT are transforming how we interact with technology. Similarly, systems such as Apple's Siri, Google's Assistant, Amazon's Alexa, Bard, IBM's Watson, Microsoft's Cortana, and Samsung's Bixby are becoming increasingly sophisticated. As these conversational agents advance, concerns about their ethical use and societal impact intensify, emphasizing the need for responsible usage [20], [21], [22], [23], [24], [25]. Issues in AI systems stem from the necessity to defend against potential threats and ensure the protection of individuals from AI-generated decisions that could jeopardize their wellbeing [26]. Similarly, Twinomurinzi and Gumbo [27] identified 'human,' 'ethics,' and 'decision-making' as three main non-technology focuses of research involving ChatGPT. In response, academic publishing has opted to encourage the responsible use of these AI tools by launching clear guidelines [28]. Establishing a consensus on the regulation of Chatbots in scientific writing holds significant importance [29].

While, the application of ChatGPT in education spans various disciplines. Noteworthy research has illuminated unique facets of ChatGPT's integration into the educational environment [20], [21], [30], [31], [32]. Lund et al. [33] provide insights into scholarly publishing, while many contributions are oriented towards scientific research [34], [35], [36], illustrating ChatGPT's broad academic applications. Yan [37] explores L2 learning, and Ray et al. [9] examines its impact on customer service, healthcare, and education. While acknowledging AI's transformative potential, several studies caution against overlooking ChatGPT's limitations, such as factual inaccuracies and biases [4], unequal access to AI-driven analytics, learning stagnation, discriminatory outcomes, privacy breaches, and harmful content generation [25], and considering overall potential risks and ethical dilemmas [38]. In addition, Akgun and Greenhow [39] noted that despite AI's potential benefits for learning and teaching, its ethical and societal drawbacks are often overlooked in K-12 education; these challenges should be identified and introduced to teachers and students. Recognizing these pitfalls, stakeholders advocate for coherent regulations and ethical guidelines in educational settings [25]. Therefore, our study aims to examine the integration of generative AI within the educational environment by investigating the decision-making framework for utilizing ChatGPT in the educational sector.

B. RESEARCH GAP AND MOTIVATION

The emergence of ChatGPT has garnered significant attention from scholars and academics, sparking a surge in research initiatives. In the realm of societal and educational applications

of Gen-AI, decision-makers and stakeholders are confronted with a pivotal choice: whether to restrict or legislate the usage of Gen-AI [17]. While, the decision on a policy strategy often hinges on assessing the negative and positive impacts of the AI tool. However, a critical challenge arises as policymakers lack a robust decision support framework to make informed Gen-AI implementation decisions. Additionally, stakeholders find themselves without an approach to effectively rank available policies for Gen-AI application decisions in education. Given that effectively addressing the ethical challenges associated with ChatGPT relies heavily on making judicious policy strategy choices, the motivation for this study arises from the numerous ethical concerns about ChatGPT identified previously [40] and the limited application of Multi-Criteria Decision-Making (MCDM) within the realm of the ChatGPT ethics conundrum.

As a result, this paper delves into the complex discourse surrounding the regulation of Gen-AI, with a specific focus on the renowned ChatGPT, a generative artificial intelligence model developed by OpenAI to generate human-like text based on the input it receives. Society now faces the choice of whether to use ChatGPT or not, through restriction or legislation, as highlighted in a previous study [17]. While the dichotomy between restricting and legislating [17], [18] Chatbots encapsulates the core dilemma faced by policymakers, developers, and society at large. Striking the right balance is crucial to harnessing the benefits of these intelligent systems while mitigating potential risks. To address this multifaceted issue, this study leverages the Analytic Hierarchy Process (AHP), a robust decision-making framework, as a lens through which to examine and evaluate the diverse facets of regulating Chatbots. The objective of this paper is two-fold:

- To identify and prioritize ethical concerns related to ChatGPT from the existing literature and frequency of occurrences method.
- To examine the most frequent ethical concerns and alternative policy strategies through the comparison matrices of the AHP.
- To propose a decision-making framework for the utilization of Gen-AI in education.

By doing so, the study aims to contribute valuable insights into the debate surrounding the governance of Gen-AI, offering a systematic approach for evaluating the ethical concerns as well as regulatory and policy strategy dimensions of these powerful AI tools. Hence, addressing the decision-making problem of whether to use restricted or legislated ChatGPT, by extension, LLMs or Chatbots, is the central focus of this study.

C. PAPER ORGANIZATION

The organization of this research article is structured as follows: Section II explores the research background through a detailed discussion of related studies, setting the context for the current research. Section III outlines the research methodology, including a systematic literature review and the implementation of the AHP for the MCDM model. Section IV presents the results of the study, providing insights and analyses derived from the applied methodology. Section V covers the discussion of the study, highlighting the implications of the findings and suggesting future avenues for further research contributions. Finally, section VI concludes the research.

II. RELATED STUDIES

The literature review navigates two distinct yet interrelated paths of exploration concerning Chatbots and LLMs. On one avenue, the focus is directed toward understanding the intricate ways in which Gen-AI or Chatbots influence decision-making processes across diverse domains. In this category, researchers delve into the impact of these conversational agents on users' choices, behaviors, and perceptions. Concurrently, the second avenue of inquiry scrutinizes the adoption of Gen-AI tools, placing them on the proverbial scale to assess their merits against ethical considerations and understand the adoption and usage patterns. Scholars weigh the benefits these tools bring, juxtaposed with the potential ethical dilemmas they might pose. In this intricate landscape, the present study finds its niche, aligning with the latter category, and seeking to explore the facets of Gen-AI adoption, considering and navigating the ethical terrain for optimal utilization. This dual perspective paints an inclusive picture of the contemporary state of research in the realm of Chatbots and LLMs, setting the stage for an early exploration of their role in decision-making and adoption dynamics. The proceeding sections discuss these categories.

A. INFLUENCE OF GEN-AI ON DECISION MAKING

Several studies examine how ChatGPT and other conversational AI systems influence decision-making processes among users. For example, Yu et al. [41] contribute by addressing challenges in knowledge-grounded response generation models, introducing Dial-QP, a BART-based model, to enhance the decision-making process in conversational query production. Similarly, [42] delves into privacy concerns and user mistrust in Conversational AI systems, proposing three privacy strategies to empower users and promote rational decision-making. Reference [43] explores ethical, legal, and social concerns related to human intervention in AI systems, advocating for contestability and redress mechanisms. Reference [44] investigates the potential role of ChatGPT in ethical decision-making for physicians, emphasizing the need for close observation due to rapid technological development. Furthermore, [45] examines the impact of ChatGPT on teleconsultants in healthcare, identifying positive themes such as informational support and decision-making, along with negative themes such as misdiagnosis and ethical issues. In addition, [46] explores the delegation of procedural consent to large language models in medicine, discussing ethical implications and potential benefits in certain clinical situations. Reference [47] addresses

TABLE 1. Summary of existing studies for the adoption and decision making of Chatbots.

S/N	Ref.	Focus/ Aim	Method	Key Findings/ Contributions	Field
1	[49]	AI's role in medicine from the perspectives of surgical residents.	Cross-sectional study surveying general surgery residents	Concerns about AI making life decisions, positive attitudes towards AI for repetitive tasks, positive correlation between AI familiarity and positivity	Health care
2	[50]	Factors of decision-making processes and the intentions to use ChatGPT for self-diagnosis.	Cross-sectional survey; PLS-SEM analysis	Higher performance expectancy and positive risk-reward appraisals positively associated with decision-making outcomes for self-diagnosis	Health care
3	[51]	Perceptions of educators and students on the use of ChatGPT in education.	Qualitative research approach, in-depth interviews, content analysis, and NVivo.	Positive perceptions of using ChatGPT in education, concerns about accuracy of information and loss of personal interaction	Education
4	[52]	Ethical challenges of using ChatGPT in Software Engineering (SE) research	Literature survey, questionnaire-based survey, ISM and Matrix Multiplication Applied to Classification (MICMAC) analysis	Motivators and demotivators for using ChatGPT in SE research; Ethical principles, create a cluster-based decision model for integrating ChatGPT in SE research	Software Engineering
5	[27]	The sentiments regarding ChatGPT from scholarly discourse obtained from 67 publications.	Manual thematic analysis, AI function in Atlas.ti	Majority positive sentiment from scholars, concerns around ethical issues, recommendations for education reform; academia should co-exist with the tool	Education
6	[53]	AI Alignment problem with Large Language Models (LLMs); propose a systematic mapping of stakeholders' AI adoption, focusing on balanced discourse in AI adoption.	Conceptual	View of AI alignment as a process shaped by powerful stakeholders; Proposal of i*for systematic discourse analysis based on Brent Flyvbjerg on values and power in human decision-making.	General
7	[54]	Examination of students' attitudes toward using ChatGPT as a learning tool.	Quantitative approach, descriptive study design	High level of positive attitude toward using ChatGPT, concerns about precision of data and anxiety about non-accessibility. Encourages incorporation of ChatGPT into curricula, acknowledges student concerns, and suggests risk mitigation strategies.	Education
8	[55]	Mechanism of quality assessment in the communication process between human-machine (Chatbots) and users customer service.	PLS-SEM analysis of user perceptions	Users' perception of the robot's ability significantly affects the evaluation of communication quality; Language style has little impact.	Business
9	[12]	Assessment of practices and knowledge of healthcare workers (HCWs) towards ChatGPT in KSA.	Cross-sectional survey among 1057 HCWs	18.4% used ChatGPT for healthcare; 84.1% non-users interested; Concerns about credibility and source of information. 75.1% were comfortable with incorporating ChatGPT into their healthcare practice.	Health care
10	[56]	Ethical issues in Health Professions Education (HPE) with the advances in AI; Guide format explaining ethical principles in the context of AI in HPE.	Conceptual	Discussion on ethical principles in HPE with the use of AI; Suggests guidelines for educators and decision-makers	Health care education
11	[57]	Examination of ChatGPT usage, concerns, views, and perceived ethics among UAE students.	Data gathered from students; Path analysis	ChatGPT considered revolutionary, concerns about its effects on educational integrity; Acknowledges both useful and concerning effects of ChatGPT; Recommends practical guidelines for informed decisions and policies, and usage.	Education
12	[58]	Examining community pharmacists' awareness, willingness, and barriers to the incorporation of ChatGPT in pharmacy practice.	48.4% pharmacists willing to incorporate ChatGPT; Concerns about the tool's ability to make human-like judgments and ethical decisions.	Cross-sectional study among community pharmacists	Health care
13	[59]	Evaluation of GPT-4 in responding to complex medical ethical vignettes; Utility and limitations for aiding medical ethicists decision making.	Cross-sectional survey, mixed-methods approach	GPT-4 rated high in technical and non-technical clarity; Struggled with nuanced aspects of ethical dilemmas	Health care
14	[60]	Investigation of the effects of Chatbots vignettes with and without socio-emotional features on the intention to use the Chatbots for financial support purposes.	Between-subject online experiment, involving two groups of participants. The control group was exposed to XRO23, and the experimental group with more human-like characteristics, identified as Emma; all featuring secure and reliable Chatbots.	Perception of social presence increased with more human-like Chatbots (Emma); No significant increase in trust levels or decrease in privacy concerns; Intention to use positively influenced by perceived humanness and trust	Banking
15	[61]	Factors influencing solo travelers' purchase intentions when using AI Chatbots in the travel industry based on complexity theory; affective characteristics, communication quality, and marketing efforts.	PLS-SEM, fuzzy-set qualitative comparative analysis (fsQCA)	Interaction, communication competence, trendiness, entertainment, and satisfaction were found to have significant direct effects on solo travelers' purchase intentions.	Travel industry
16	[16]	The viewpoints of Chinese scholars and experts on the implementation of Gen-AI in education	SLR, qualitative, conceptual	Academic integrity and students' critical thinking skills issues. Proposed framework DATS: developers, administrators, teachers, and students for future Gen-AI applications in schools.	Education
17	[40]	Proposing a policy-making framework of Gen-AI based on the risk, reward, and resilience (RRR) and decision-making rules	SLR, qualitative, conceptual	Enhance efficiency in text summarization and workload reduction- poses risks of plagiarism and cheating; accessing vast information as rewards- introduces misinformation and copyright issues; developing tools to detect plagiarism and misinformation can improve academic integrity- exacerbate the educational equity issues and job losses; legislation on ChatGPT- decreasing rewards.	Generic, Education

the global water crisis, exploring the use of ChatGPT in water management for enhancing water quality control and decision-making. Finally, [48] investigates ChatGPT's role in clinical decision support, emphasizing potential benefits and proposing a framework for future systems, considering challenges like biases. This collective body of research highlights the multifaceted impact of conversational AI on decision-making across various domains and underscores

the importance of addressing ethical considerations and user empowerment in these technological advancements.

B. GEN-AI ADOPTION AND DECISION MAKING

The studies presented in Table 1 collectively offer valuable insights into the decision aspect of Chatbots and LLMs. For instance, [49] explores the perspectives of surgical residents on AI's role in medicine, raising concerns about AI in life decision-making. Reference [50] examines factors influencing users' perceptions of decision-making processes and intentions to use ChatGPT for self-diagnosis, revealing positive risk-reward appraisals associated with decision-making outcomes. Similarly, [51] investigates the perceptions of educators and students regarding the use of ChatGPT in education. In addition, [52] contributes by addressing the ethical challenges in software engineering, proposing a cluster-based decision model for integrating ChatGPT based on motivators and demotivators identified in the literature. This literature synthesis underscores a significant gap related to the decision-making processes in the adoption and application of Chatbots and LLMs, providing a foundation for the present study to explore these dimensions further.

Adding to the discourse, [27] conducted a scoping review of sentiments on ChatGPT in scholarly discourse, revealing a majority of positive sentiment among scholars, coupled with concerns around ethical issues. The emphasis on the need for education reform and the co-existence of academia with AI tools becomes apparent. The work by [53] offers a conceptual perspective on the AI alignment problem with LLMs, proposing a systematic mapping of stakeholders' AI adoption. Ajlouni et al. [54] quantitatively examine students' attitudes toward using ChatGPT as a learning tool, finding a high level of positive attitude but also concerns about data precision and non-accessibility anxiety. Their encouragement for the incorporation of ChatGPT into curricula, along with risk mitigation strategies, contributes to educational considerations. Moreover, [55] utilizes PLS-SEM analysis to explore the influence mechanism of quality assessment in the communication process between users and human-machine customer service, shedding light on users' perceptions affecting communication quality. Reference [12] assess the knowledge, attitudes, and practices of healthcare workers (HCWs) in Saudi Arabia toward ChatGPT, revealing both interest and concerns, with a substantial percentage comfortable with incorporating ChatGPT into healthcare practice.

Furthermore, [56] discusses ethical issues in Health Professions Education (HPE) with AI advances, proposing guidelines for educators and decision-makers. Reference [57] examines ChatGPT usage among students in the UAE, addressing concerns and ethics while recommending practical guidelines for informed decisions. Moreover, [58] investigates community pharmacists' awareness, willingness, and barriers to incorporating ChatGPT in pharmacy practice, uncovering both willingness and concerns about the tool's ability to make human-like judgments. Reference [59] evaluates GPT-4 in responding to complex medical ethical vignettes, highlighting its utility and limitations for aiding medical ethicists in decision-making. Additionally, [60] contributes to the financial technology domain by investigating the effects of Chatbots vignettes on the intention to use for financial support purposes. Their findings reveal preferences for FinBots, indicating that socio-emotional support may not be favored when designed independently for the financial function [60].

Moreover, [61] explores factors influencing solo travelers' purchase intentions when using AI Chatbot in the travel industry, using complexity theory to reveal significant direct effects on solo travelers' purchase intentions from aspects like interaction, entertainment, trendiness, communication competence, and satisfaction. In addition, [16] proposed developers, administrators, teachers, and students, known as the DATS framework for future Gen-AI applications in schools. The framework reports consensus among Chinese scholars on the application of ChatGPT in schools. Finally, [40] proposed a decision-making framework that aimed to guide development of policies on the usage of ChatGPT based on risk, reward, and resilience (RRR) elements. The integrative framework is conceptual and applied, guided by decision-making processes and rules to help policymakers navigate decision-making conundrums regarding ChatGPT. Hence, refer to Table 1 for the main focus, method, and key contributions of the existing studies in various fields.

C. SUMMARY

The current literature collectively offers a thorough synopsis of the up-to-date state of research on decision-making aspects related to Chatbots and LLMs across various domains. However, apart from the work of Liu et al. [16], the DATS framework, and Bukar et al. [40], integrative RRR framework, which are all based on SLR, there is an outstanding research gap in understanding the intricate decision processes involved in the adoption and application of LLMs using MCDM models, warranting further investigation. Specifically, the literature contributes valuable insights, each shedding light on specific facets, and collectively lays the groundwork for more insights and comprehensive research in the realm of Chatbots and LLMs. Interestingly, building upon the insights from the analysis of existing literature, there emerges a critical research gap in the application of decision-making models, such as the AHP, to systematically rank policy alternatives for the optimal utilization of ChatGPT.

While the reviewed studies contribute substantially to understanding user perceptions, attitudes, concerns across diverse domains, and conceptual decision-making frameworks, there remains a need for a structured decision-making framework that can guide policymakers in prioritizing and implementing policies related to Gen-AI. AHP, known for its ability to handle complex decision scenarios by systematically decomposing problems into a hierarchy of criteria and alternatives [62], [63], [64], [65], [66], is not similar to PLS-SEM or path analysis as employed by existing

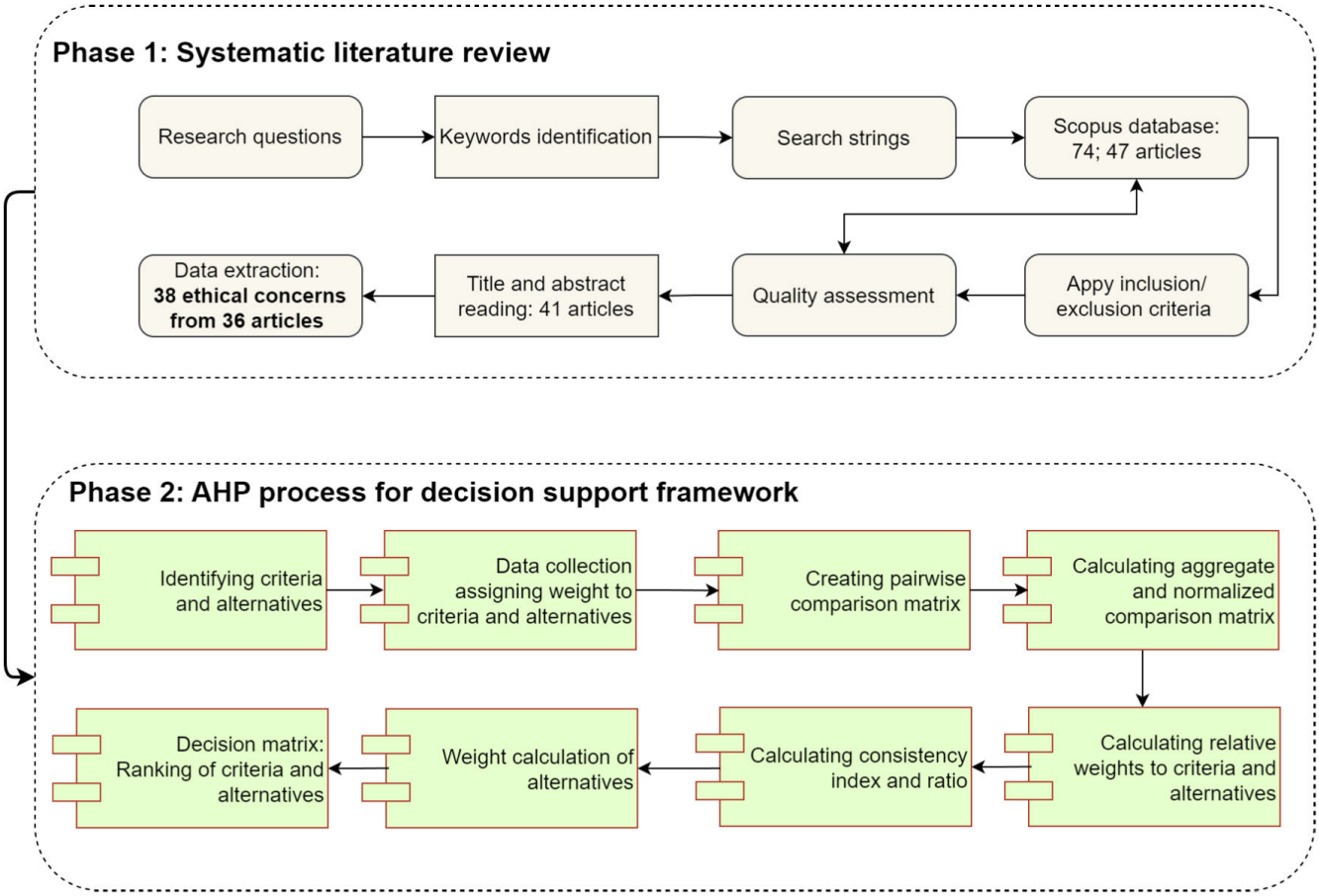

FIGURE 2. Proposed research methodology.

literature [50], [55], [57], [61], could serve as a powerful tool. This research gap highlights the lack of a comprehensive, systematic approach to policy strategy selection and decision-making in the adoption and application of ChatGPT. As the field continues to evolve, bridging this gap could significantly contribute to evidence-based policymaking and the responsible deployment of ChatGPT in education and other sectors.

III. RESEARCH METHOD

The primary objective of this study is to propose a decision-making framework grounded in MCDM, utilizing the AHP, for the integration of ChatGPT in higher education. This framework incorporates ethical considerations and alternative policy strategies, aiming to showcase its practical applicability. To accomplish this goal, ethical concerns and potential risks associated with ChatGPT are identified through a Systematic Literature Review (SLR) [40], to ensure the thoroughness and rigor of the search process [67], [68], [69], [70], [71], [72], and to ascertain the themes related to ethical concerns of ChatGPT. Given the adoption of the SLR approach and AHP technique, Figure 2 illustrates the typical concept of the research methodology, which are discussed accordingly in the proceeding sections.

A. EXECUTION OF SYSTEMATIC LITERATURE REVIEW

The SLR is a well-established approach for thoroughly exploring and assessing a research topic. This method entails reviewing, evaluating, and analyzing chosen published works against specific questions within a preplanned procedure. In contrast to a conventional literature review, outcomes from a SLR are deemed to be less biased, more dependable, and more precise, which involves three typical phases: organizing the review, conducting the review, and reporting the findings [68], [70]. As demonstrated in Figure 2, the initial stage of the study involved executing a systematic literature review. Following Kitchenham's guidance [68] for the identification of ethical issues in the literature, aligning with the methodology employed by prior studies [67], [68], [69], [70], [71], [72]. The steps undertaken for the SLR encompassed formulating study questions, identifying and consolidating keywords, creating search strings, establishing inclusion/exclusion criteria, conducting quality assessments, and synthesizing and analyzing the amassed data, as presented in Figure 2 (phase 1). A comprehensive explanation

of the SLR phases, as well as the identified ethical issues and risk of the ChatGPT ethics conundrum is presented in Bukar et al. [40].

Accordingly, the SLR protocol guided the determination of research keywords, identified as crucial for understanding the scope of the retrieved materials. Following the guidelines of selecting keywords for review study [73], [74], this study keywords include ''ChatGPT,'' ''large language models,'' ''LLMs,'' ''ethical issues,'' ''concerns,'' ''ethics,'' and ''implications,'' were employed in search queries on the Scopus database. An initial search yielded 74 results, refined to 47 articles through specific limitations. The paper selection involved the review of titles and abstracts, excluding six papers based on criteria such as non-English content and lack of alignment with the study's focus. Ultimately, 41 articles were selected for data extraction and analysis, focusing on concerns associated with the ChatGPT ethics conundrum. The systematic data extraction aimed to categorize themes related to ethical issues namely risks (ethical issues), resilience, and rewards. As a result, 38 ethical issues were extracted from 36 articles. The entire process adhered to established guidelines, ensuring the quality and relevance of the final outcome.

B. SELECTION METHOD AND CRITERIA OF ETHICAL CONCERNS FOR AHP ANALYSIS

The data extracted from the SLR study [40] served as a foundational study in identifying and synthesizing the list of ethical and risk-related concerns associated with the implementation of ChatGPT. Building upon these insights, this study strategically refined and narrowed down these ethical concerns based on their frequency. Notably, 38 ethical concerns were identified in the literature. A duplicate and thematic filtering process was conducted, resulting in 26 concerns. In particular, this study meticulously examined the information obtained during the review to pinpoint recurring themes, including common topics, ideas, patterns, and approaches. A primary theme was identified when the extracted data showed connections to other themes sharing a similar context. For instance, themes like copyright, compliance with copyright laws, consent, and legal issues were grouped, as were themes like misinformation, quality of output, infodemics, and inaccuracy of information (refer to Table 2). This process aided this study in comprehending the various themes reported in existing studies.

In another instance, one pragmatic way to assess the relevance of themes is by examining the frequency of their occurrence [75]. Thus, the selection of ethical concerns for AHP analysis is guided by selection and frequency of occurrence techniques, informed by existing studies [76], [77], [78], [79], [80], to streamline the complexity and prioritize key concerns. Thus, 26 ethical concerns underwent additional analysis to select the most significant ones based on their frequency of occurrence in the literature. Initially, a selection technique [76] was employed to mitigate bias during the selection process. This study applied a selection strategy concept to choose the ethical concerns (EC), at EC > 3. i.e if the occurrence of EC is greater than 3, it is considered for AHP analysis. This process is repeated until none of the ethical concerns meet the criteria.

Subsequently, the frequency of occurrence (FO) metric was utilized to quantify the prevalence of ethical concerns in the literature. FO is a straightforward metric that measures the proportion of instances where a particular ethical concern is present, often expressed as a percentage. It can be calculated using Equation 1:

$$FO = 100\% \times \frac{n}{N} \tag{1}$$

where 'n' represents the number of occurrences of a specific ethical concern, and 'N' is the total number of observations.

Accordingly, the selection and frequency of occurrence techniques were employed to identify the most significant ethical concerns. The adoption of these techniques ensured a systematic and data-driven approach to the selection of ethical concerns for further investigation, thereby enhancing the relevance and significance of the study findings.

C. SELECTION OF DECISION ALTERNATIVES AND RATIONALE

The selection of the alternatives 'Restriction' and 'Legislation' for examination in the AHP analysis is grounded in perspectives from existing literature. As a result this study draws upon the insights provided by Dwivedi et al. [17] and Lim et al. [18], which underscore the multifaceted discourse surrounding the governance of ChatGPT. Specifically, Dwivedi et al. [17] highlights the divergent perspectives on ChatGPT's usage, from 43 experts contributions across diverse fields, with some advocating for restriction on its deployment while others argue against such limitations. Similarly, Lim et al. [18] emphasize the potential risks associated with ChatGPT, advocating for regulatory measures or even prohibition in extreme cases. These differing stances highlight the delicate discourse surrounding the governance and control of ChatGPT, with opinions ranging from advocating for cautious limitations to regulatory measures, reflecting the ongoing debate on the technology's societal impact and ethical considerations.

In addition, the paper by Dwivedi et al. [17] holds significant weight in our study due to its extensive scope and authoritative analysis. With over seventy co-authors contributing to its findings and insights, and an in-depth examination of 43 perspectives from leading experts across various fields. This breadth of expertise and depth of analysis lend credibility to the perspectives presented in the paper, making it a pivotal source for understanding the complex discourse surrounding ChatGPT. Moreover, it's noteworthy that the co-authors of the Dwivedi et al. [17] paper have consented to the alternative options outlined in their study. Their endorsement further underscores the relevance and validity of the alternatives ''Restriction'' and ''Legislation''

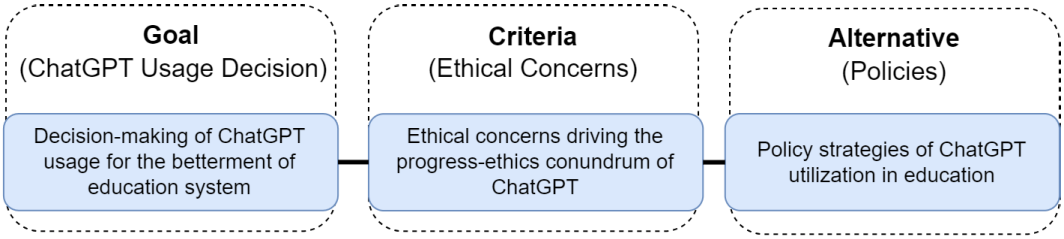

FIGURE 3. Framework for ethical concerns and policy for ChatGPT utilization.

within the context of ethical considerations surrounding ChatGPT. As a result, it is our understanding that this alignment of expert opinion with the alternatives selected for our study would strengthen the credibility and applicability of the research framework and findings.

D. AHP METHOD

The second phase of this study involved developing a MCDM model based on the AHP technique. MCDM is a decision-making approach that considers multiple criteria for ranking the alternatives and select the most suitable option [64], [65], [66]. The technique finds applications in various fields such as engineering, economics, and management science, with two primary classes: Multi-Attribute Decision Making (MADM) and Multi-Objective Decision Making (MODM) [80]. The MADM deals with discrete factors and a limited number of alternatives, while MODM involves continuous variables and unlimited alternatives. The MADM, also known as MCDM, commonly used techniques include TOPSIS, GDM, ELECTRE, SWARA, AHP, and ANP [80], [81], [82], [83].

Accordingly, Saaty's AHP is a pivotal MCDM method known for its precision, flexibility, and hierarchical structure [84], [85]. It simplifies complex problems by breaking them into sub-problems and is effective in handling intangible and tangible variables in multi-criteria decision-making scenarios. The AHP is particularly suitable for situations involving intuition, logic, and irrationality, especially in the presence of risk and uncertainty [80]. Similarly, the AHP has demonstrated efficacy in addressing multi-criteria decision-making problems in various domains, as evidenced by previous studies [64], [65], [66], [76], [80], [86]. The approach organizes criteria and alternatives systematically, providing a structured solution for decision-making in diverse fields [62], [63], [64], [65], [66].

The main objective of the current research is to determine the relative priorities or weights of ethical issues and to rank the existing policy alternatives for ChatGPT application and utilization in education. Thus, selecting the most effective policy strategy for ChatGPT utilization, and by extension Gen-AI, involves considering various criteria. Given that the choice of the optimal policy strategy is contingent on multiple variables, decision-makers choose among the two available alternatives based on various multifaceted ethical concerns. This decision-making process is inherently a multi-criteria decision-making problem. To address this challenge, this study employed the AHP technique as the suitable approach for this research problem from the available MCDM options [64], [66], [87]. Therefore, the classical AHP was utilized to assign weights to ethical concerns and policy strategy alternatives for ChatGPT utilization in education. The typical AHP procedure is illustrated in Figure 2 (phase 2) and the decision framework is illustrated in Figure 3. By employing a pairwise comparison scale for the AHP analysis, the scale adopted in this study to quantity preferences among criteria (ethical concerns) and policy strategy alternatives is given in Appendix, Table 8.

E. DEVELOPING AHP QUESTIONNAIRE, EXPERT CRITERIA, AND DATA COLLECTION

The pairwise comparison method involves presenting respondents with two criteria or alternatives, and asking them to assess their relative preference and importance [84]. In this study, respondents were given matrices for pairwise comparisons, with a sample comparison matrix questionnaire for the decision criteria shown in Figure 4. Similarly, pairwise questionnaire matrices were created for alternatives, restrictions, and legislation. The questionnaire was designed to collect relevant data in the form of regular scales and matrices, which contained ten criteria and policy strategy alternatives. To assign relative scores to these pairwise comparisons among the different criteria and alternatives, the nine-point scale introduced by Saaty was used [84] (see Appendix, Table 8). In addition, detailed explanations of each criterion and decision alternatives were provided in the AHP questionnaire to ensure that respondents had a comprehensive understanding of the concepts under consideration.

Because the AHP gathers input from individuals with specialized knowledge about the subject under investigation, allowing for meaningful insights and comparisons. The questionnaires were administered to a panel of experts via email for their input and assessment. The main selection criterion for the expert panel was individuals working at higher institutions, particularly universities. The experts are affiliated with reputable universities and colleges, engaged in cutting-edge research and teaching in their respective fields, providing them with a deep understanding of both theoretical concepts and practical applications of ChatGPT utilization in the educational environment. Additionally, we ensured that respondents had an information technology (IT) background

	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	EC9	EC10
EC1	1	2	1/4	1/2	1/5	1/2	1/3	1/2	1/2	1
EC2	1/2	1	1/3	1/4	1	2	1/2	1/2	1/2	1
EC3	4	3	1	2	1/2	3	3	2	4	7
EC4	2	4	1/2	1	1/5	4	1/3	1/2	4	3
EC5	5	1	2	5	1	3	2	1/2	2	6
EC6	2	1/2	1/3	1/4	1/3	1	1/2	1/3	1/2	1/2
EC7	3	2	1/3	3	1/2	2	1	1/2	1	3
EC8	2	2	1/2	2	2	3	2	1	1	3
EC9	2	2	1/4	1/4	1/2	2	1	1	1	2
EC10	1	1	1/7	1/3	1/6	2	1/3	1/3	1/2	1

FIGURE 4. Pairwise comparison matrix of the responses.

to ensure their expertise was relevant to the study's objectives, which likely involved advanced IT concepts and technologies, such as ChatGPT. This criterion ensured that the selected experts possessed the necessary technical knowledge and academic rigor to contribute effectively to the study.

Accordingly, the questionnaire allowed us to systematically gather expert opinions to assess the importance and relationships between alternatives and decision criteria in the context of ChatGPT utilization. More than 30 experts from diverse institutions in Malaysia, the USA, Iraq, China, and other countries were contacted to contribute their insights regarding the significance of various criteria and alternatives for ChatGPT utilization. The study collected and documented 12 responses in MS Excel. Each expert had at least three years of experience in IT or related disciplines such as computer science, software engineering, computer networks, machine learning, and information systems (refer to Appendix, Table 9). However, the analysis revealed that 2 of these responses exhibited inconsistencies, as explained in section IV-C3. Consequently, these 2 responses were deemed unsuitable for inclusion, leaving the study with a total of 10 valid responses that form the basis of the findings presented in this study.

IV. RESULT AND FINDINGS

This section comprehensively explores the results and findings stemming from the study. As outlined in the preceding section, the methodology was divided into two distinctive phases, and the outcomes are consequently explained in tandem with each methodological approach. Firstly, the study delves into a detailed discussion of the ethical concerns that were identified and garnered through the SLR, shedding light on their prevalence in the existing body of literature through the frequency of occurrences. This initial exploration sets the stage for the subsequent analysis. Secondly, the culminating findings of the SLR serve as pivotal criteria for the AHP analysis, an integral aspect discussed in consequent sections. The outcome of these interconnected processes is methodically elaborated upon to provide a comprehensive understanding of the study's findings.

A. OVERVIEW OF ETHICAL CONCERNS

The integration of AI in education presents numerous ethical concerns spanning various dimensions, as presented in Table 2. In this section, a brief overview of the types of concerns identified during the review is discussed. In particular, infodemics and misinformation [17], [29], [31], [32], [35], [88], [89], [90], [91], [92], [93], [94], [95] implies that AI systems can produce inaccurate, outdated, or nonsensical content, leading to the spread of misinformation and reducing the quality of educational outputs. Safety and security [17], [20], [32], [56], [89], [90], [92], [96], [97], [98] indicates that AI applications raise cybersecurity concerns, potentially exposing students and institutions to various threats. Bias response [17], [31], [56], [89], [92], [96], [98], [99] shows that ChatGPT may perpetuate or even exacerbate existing biases, leading to unfair or discriminatory outcomes. Plagiarism [21], [29], [30], [31], [33], [34], [89], [99] indicating that the ease of generating content with ChatGPT increases the risk of plagiarism, undermining academic integrity. Privacy and confidentiality [17], [56], [88], [90], [92], [100], [101], AI systems often handle sensitive data, raising concerns about data confidentiality and the potential for privacy breaches.

The use of AI in education challenges traditional notions of academic integrity [21], [30], [31], [37], [99], [101], [102], necessitating new guidelines and standards. Risk of hallucination and misleading information [36], [89], [90], [91], [95], [101], [103] due to AI-generated content can be deceptive. The digital divide [21], [29], [31], [37], [98], [99] can be exacerbated by unequal access to AI technologies, leading to disparities in educational opportunities. The use of AI-generated content raises complex legal questions about copyright, consent, and compliance [33], [36], [56], [89], [91]. Similarly, the AI systems may produce incorrect or improperly formatted references [33], [35], [89], [93], [95], complicating academic work. The use of AI challenges traditional notions of authorship and can lead to issues of impersonation and ownership [33], [56], [104]. In addition, AI integration in education affects job roles and expectations [33], [90], [105], necessitating adaptation and new skill sets. Overreliance on ChatGPT can lead to a decline in critical thinking and reasoning skills among students [24], [31], [106].

Moreover, additional ethical issues identified include the need for transparency [56], [89] in how AI systems operate and make decisions, reliability [94], [99] of AI-generated content, encourage laziness and reduce students' self-reliance and motivation to learn deeply [24], [34], and may not foster deep understanding of subjects [31], [95]. Moreover, other ethical issues include fidelity [101], [107], exploitation [20], responsibility, autonomy, beneficence, and anonymity [56], accountability [99], mimicking people [103], and emotion [101]. These ethical concerns call for stakeholders to ensure responsible and beneficial integration of AI in educational contexts. The selected ethical concerns for AHP analysis are discussed in the section that follows.

B. SELECTED ETHICAL CONCERNS FOR AHP ANALYSIS

As noted, the process of data extraction and synthesis uncovered 38 ethical concerns related to the application

TABLE 2. Key ethical issues and concerns of ChatGPT based on frequency analysis (F = Frequency, FO = Frequency of Occurrence; Total selected papers = 36).

S/N	Concerns	Ref	F	FO%	Similar themes
1	Infodemics and misinformation	[17], [29], [31], [32], [35], [88]–[95]	18	16.07	Quality of output, inaccuracy, nonsense content, Data not apparently updated; limited knowledge, lack of originality
2	Safety and security concern	[17], [20], [32], [56], [89], [90], [92], [96]–[98]	10	09.26	Cybersecurity concerns
3	Bias response	[17], [31], [56], [89], [92], [96], [98], [99]	08	07.41	
4	Plagiarism	[21], [29]–[31], [33], [34], [89], [99]	08	07.41	
5	Privacy and confidentiality	[17], [56], [88], [90], [92], [100], [101]	07	06.48	Data confidentiality
6	Academic integrity concern	[21], [30], [31], [37], [99], [101], [102]	07	06.48	
7	Risk hallucination through manipulation and mislead	[36], [89]–[91], [95], [101], [103]	07	06.48	Deception
8	Educational equity	[21], [29], [31], [37], [98], [99]	06	05.56	Digital divide
9	Copyright, legal, and compliance issues	[33], [36], [56], [89], [91]	05	04.63	Consent
10	Incorrect reference and citation practices	[33], [35], [89], [93], [95]	05	04.63	
11	Ownership, authorship, impersonation	[33], [56], [104]	03	02.78	
12	Job expectations and evolution	[33], [90], [105]	03	02.78	
13	Declining cognitive and reasoning skills	[24], [31], [106]	03	02.78	
14	Transparency	[56], [89]	02	01.85	
15	Reliability	[94], [99]	02	01.85	Factual reliability
16	Self-reliant and lazy	[24], [34]	02	01.85	
17	Lack of deep understanding	[31], [95]	02	01.85	
18	Fidelity	[101], [107]	02	01.85	
19	Exploitation	[20]	01	00.93	
20	Responsibility	[56]	01	00.93	
21	Autonomy	[56]	01	00.93	
22	Beneficence	[56]	01	00.93	
23	Anonymity	[56]	01	00.93	
24	Accountability	[99]	01	00.93	
25	Mimic people	[103]	01	00.93	
26	Emotion	[101]	01	00.93	

of ChatGPT. These concerns were streamlined to 26 after duplicate and thematic evaluation. Their frequencies were computed to discern patterns and significance in the dataset. The ethical concerns that appeared frequently were prioritized, as their recurrence indicated their prominence within the discourse surrounding ChatGPT. For example, infodemics and misinformation is the most common concerns (12.96%) among the identified ethical concerns which indicates that it is the most significant resulting from the utilization of ChatGPT. Similarly, after the infodemics and misinformation, safety and security concerns is the second highest concerns (9.26%). Thus, safety and security were found to be important. Moreover, both bias response and plagiarism are important ethical issues, with 7.41% each. Hence, refer to Table 2 for a details breakdown of the ethical concerns and their frequency of occurrences.

In light of this analysis, 10 ethical concerns were identified as key ethical issues based on their frequency occurrences in the literature, as presented in Table 2. The concerns were selected according to their recurrence in the literature, forming the basis for subsequent ranking and prioritization using the AHP. This strategic selection aims to focus on the most significant ethical aspects for in-depth exploration and informed decision-making of policy alternatives for ChatGPT utilization in education. The selected concerns are considered pivotal and serve as criteria for the AHP framework.

C. AHP ANALYSIS

The study is driven by the recognition that an effective MCDM approach is essential for aiding practitioners in prioritizing policy alternatives and making well-informed decisions regarding the utilization of ChatGPT. In pursuit of this objective, the current study introduces a decision-support framework grounded in the AHP. The framework integrates expert input and systematically ranks alternative policy strategies. Accordingly, the key steps of the AHP approach in developing a decision support framework encompass defining and identifying objectives, criteria, and alternatives, collecting data and assigning weight to criteria, creating pairwise comparison matrix, calculating aggregate comparison matrix, calculating relative weights to criteria and alternatives, calculating consistency index (CI) and consistency ratio (CR), and determining the final ranking of alternatives to produce decision matrix [64], [65], [66], [80]. The subsequent subsections provide a discussion of each of these steps and the results obtained.

1) HIERARCHICAL STRUCTURE OF CHATGPT UTILIZATION DECISION

This study adopted the chosen ethical concerns and their respective alternatives to formulate a hierarchical structure based on AHP. The hierarchical structure is depicted in

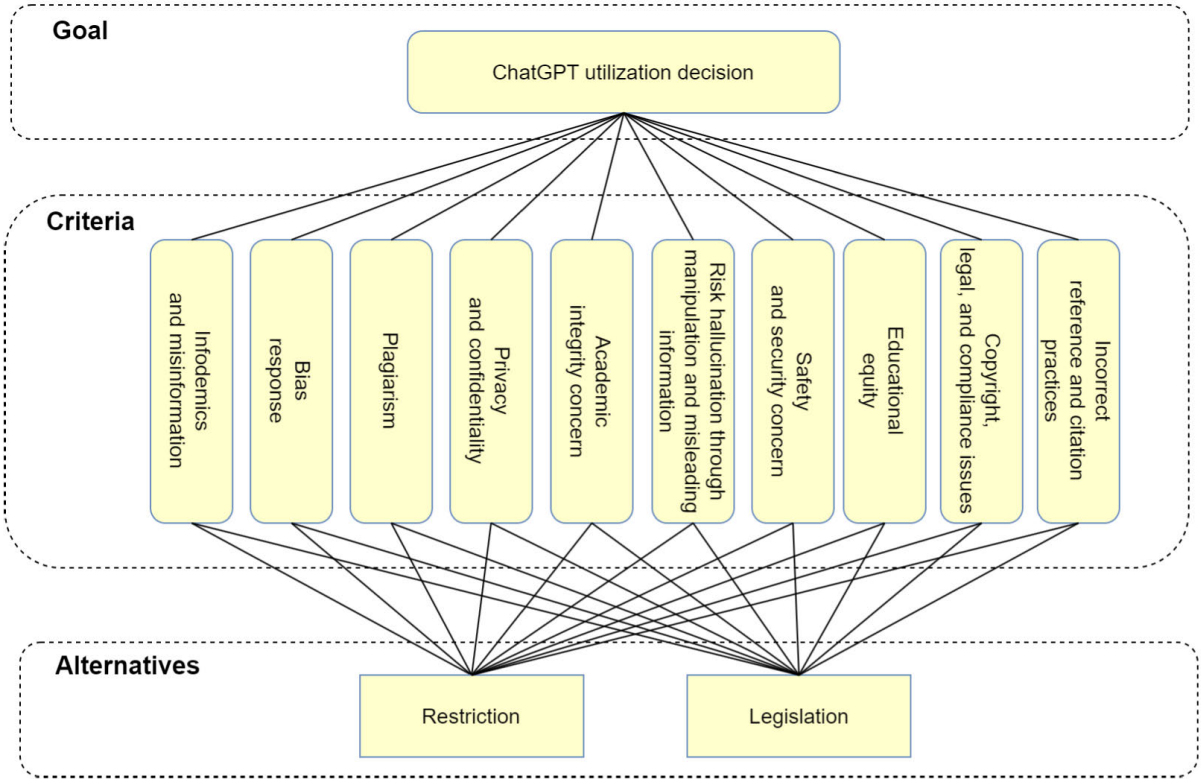

FIGURE 5. Hierarchical structure of ChatGPT utilization decision.

TABLE 3. Aggregate pairwise comparison matrix for criteria.

Ethical concerns	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	EC9	EC10
EC1	1	1 2/3	1 1/9	3/5	4/9	1	1/2	1/2	2/5	3/7
EC2	3/5	1	1 2/9	2/5	3/5	1 1/7	1/2	5/8	2/5	4/7
EC3	1	5/6	1	5/9	5/8	1 2/3	1	1	2/3	5/6
EC4	1 2/3	2 4/9	1 4/5	1	4/5	2 2/3	1	1 1/2	2/3	1 1/3
EC5	2 2/9	1 2/3	1 3/5	1 1/4	1	1 5/7	1	1 1/2	4/9	1 1/4
EC6	1	7/8	3/5	3/8	3/5	1	4/9	3/5	1/3	1/2
EC7	1 7/8	1 6/7	1	1	1	2 2/9	1	1 1/8	3/5	3/4
EC8	2 1/2	2 1/2	1 1/2	1 1/2	2 1/4	3	1 5/7	1 8/9	1	1 1/2
EC9	2 1/3	1 3/4	1 1/5	3/4	4/5	2 1/8	1 1/3	1	2/3	1
EC10	2	1 3/5	1	2/3	2/3	1 5/7	8/9	1	1/2	1
Summation	16	16 2/7	12	8	8 5/7	18 2/5	9 2/3	10 5/8	5 5/7	9 1/7

Figure 5 showing the objectives, criteria, and alternatives. At the apex of this hierarchy is the overarching goal, denoting the ChatGPT usage decision for an educational environment. The second tier of the hierarchy delineates criteria, comprising a catalog of the 10 selected ethical concerns. Meanwhile, the third tier encompasses alternatives, spotlighting the various available policy strategies for utilizing ChatGPT for the betterment of society.

2) PAIRWISE COMPARISON MATRIX OF CRITERIA

In AHP data collection, each criterion is assigned a relative score that reflects its significance concerning the overarching goal. This assessment of importance is conducted through pairwise comparisons. In this process, this study gauges the importance of one criterion relative to another, assigning a score of 9 for a significant superiority of one criterion over another, and a score of 1 for equality. If the second criterion is deemed more pertinent than the first, the reciprocal value is incorporated. Consequently, scores range from 1/9 to 9, drawing on methodologies outlined by existing studies [64], [65], [66]. The application of the proposed MCDM model involved an evaluation within an educational setting, specifically by academic staff (see Appendix, Table 9). Accordingly, Table 3 outlines and summarizes the values assigned to the criteria for all the respondents that pass the consistency test. To ensure the robustness and consistency of the responses, researchers meticulously reviewed the outcomes, 2 responses were not considered in subsequent analysis due to consistency issues. Subsequently, policy strategies were computed based on the provided input to identify the ranking of available

TABLE 4. Pairwise comparison matrix of criteria and weights.

Ethical concerns	X1										X2
	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	EC9	EC10	Weights
EC1	0.0625	0.1037	0.0919	0.0745	0.0519	0.0586	0.0555	0.0465	0.0708	0.0471	0.0663
EC2	0.0370	0.0614	0.1011	0.0513	0.0677	0.0625	0.0556	0.0583	0.0687	0.0627	0.0626
EC3	0.0566	0.0505	0.0832	0.0700	0.0714	0.0902	0.1084	0.0898	0.1165	0.0918	0.0828
EC4	0.1051	0.1500	0.1490	0.1253	0.0922	0.1449	0.1111	0.1410	0.1199	0.1476	0.1286
EC5	0.1384	0.1041	0.1338	0.1561	0.1149	0.0931	0.1111	0.1416	0.0779	0.1346	0.1206
EC6	0.0580	0.0535	0.0502	0.0470	0.0671	0.0544	0.0467	0.0549	0.0570	0.0513	0.0540
EC7	0.1168	0.1144	0.0796	0.1169	0.1072	0.1208	0.1037	0.1062	0.1024	0.0816	0.1050
EC8	0.1543	0.1562	0.1249	0.1826	0.2578	0.1666	0.1770	0.1773	0.1747	0.1600	0.1731
EC9	0.1451	0.1070	0.0992	0.0928	0.0933	0.1160	0.1390	0.0903	0.1194	0.1094	0.1111
EC10	0.1263	0.0991	0.0872	0.0835	0.0763	0.0931	0.0918	0.0940	0.0927	0.1139	0.0958

TABLE 5. Lambda max value of the pairwise comparison matrix.

Ethical concerns	X1										X2	X3	X4
	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	EC9	EC10	Weights	AW	Lambda
EC1	0.0625	0.1037	0.0919	0.0745	0.0519	0.0586	0.0555	0.0465	0.0708	0.0471	0.0663	0.6743	10.1700
EC2	0.0370	0.0614	0.1011	0.0513	0.0677	0.0625	0.0556	0.0583	0.0687	0.0627	0.0626	0.6358	10.1510
EC3	0.0566	0.0505	0.0832	0.0700	0.0714	0.0902	0.1084	0.0898	0.1165	0.0918	0.0828	0.8406	10.1481
EC4	0.1051	0.1500	0.1490	0.1253	0.0922	0.1449	0.1111	0.1410	0.1199	0.1476	0.1286	1.3069	10.1626
EC5	0.1384	0.1041	0.1338	0.1561	0.1149	0.0931	0.1111	0.1416	0.0779	0.1346	0.1206	1.2302	10.2037
EC6	0.0580	0.0535	0.0502	0.0470	0.0671	0.0544	0.0467	0.0549	0.0570	0.0513	0.0540	0.5506	10.1939
EC7	0.1168	0.1144	0.0796	0.1169	0.1072	0.1208	0.1037	0.1062	0.1024	0.0816	0.1050	1.0699	10.1930
EC8	0.1543	0.1562	0.1249	0.1826	0.2578	0.1666	0.1770	0.1773	0.1747	0.1600	0.1731	1.7663	10.2014
EC9	0.1451	0.1070	0.0992	0.0928	0.0933	0.1160	0.1390	0.0903	0.1194	0.1094	0.1111	1.1323	10.1878
EC10	0.1263	0.0991	0.0872	0.0835	0.0763	0.0931	0.0918	0.0940	0.0927	0.1139	0.0958	0.9764	10.1932
Lambda max													10.1805

alternatives. This approach aims to enhance the reliability and applicability of the decision-making process within educational environments.

3) NORMALIZED COMPARISON MATRIX AND WEIGHT OF CRITERIA

In the pivotal phase of scrutinizing the ethical conundrum surrounding ChatGPT, the determination of each ethical concern's weight assumes paramount importance, offering crucial insights into its relative significance. Employing the AHP method, which establishes a comprehensive comparison matrix, an evaluation was conducted, which facilitates the computation of weights by assigning relative importance to each identified ethical concern. The outcomes, presented in Table 4, summarize the normalized pairwise matrix of ethical concerns denoted as X1 and the corresponding calculated weights labeled as X2. Delving into the hierarchy of priorities among the identified ethical concerns, the analysis reveals that copyright, legal, and compliance issues stand out as the foremost factor, commanding the highest priority with a substantial weight of 17.31%. Not far behind, privacy and confidentiality considerations, alongside academic integrity, follow closely with significant attention, bearing weights of 12.86% and 12.06%, respectively. Furthermore, concerns related to incorrect reference and citation practices, as well as safety and security, exhibit noteworthy importance, securing priorities of 11.11% and 10.50%, respectively. Adding an intriguing layer to the analysis, educational equity and plagiarism emerge with some significance, carrying weights of 9.58% and 8.28%. Finally, the least prioritized ethical concerns include infodemics and misinformation (6.63%), bias response (6.26%), and risk hallucination through manipulation and misleading information (5.40%), in this order. This comprehensive exploration sheds light on the intricate interplay of ethical concerns, providing valuable insights into the relative weights assigned to each concern in the ethical evaluation process of ChatGPT. As the development and use of AI models continue to evolve, this knowledge and understanding of ethical priorities is instrumental in fostering responsible and accountable AI practices.

In the realm of decision-making methodologies, the concept of "consistency" holds significance as it ensures the reliability and coherence of the established pairwise relations [64], [80]. AHP, being a widely utilized method for decision analysis, introduces the consistency index and ratio as a quantitative measure to evaluate the stability of pairwise comparisons. This metric becomes particularly pivotal in discerning the validity of the decision-making process. When the CR exceeds the critical threshold of 0.10, it signals a potential lack of consistency in the pairwise comparisons, urging a reevaluation of the decision model [64], [65], [66]. On the contrary, a CR value below 0.10 provides a green light, indicating that the pairwise comparisons exhibit an acceptable level of consistency. This adherence to a specific threshold contributes to the precision and reliability of decision outcomes, enhancing the robustness of the decision-making process.

Accordingly, the CI and CR were calculated using Equations 2 and 3.

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{2}$$

TABLE 6. Weights of the policy alternatives based on respect to criteria.

Criteria	Alternatives	Restriction	Legislation	Weights
EC1	Restriction	0.5030	0.5030	0.5030
	Legislation	0.4970	0.4970	0.4970
EC2	Restriction	0.5127	0.5127	0.5127
	Legislation	0.4873	0.4873	0.4873
EC3	Restriction	0.6882	0.6882	0.6882
	Legislation	0.3118	0.3118	0.3118
EC4	Restriction	0.5266	0.5266	0.5266
	Legislation	0.4734	0.4734	0.4734
EC5	Restriction	0.4200	0.4200	0.4200
	Legislation	0.5800	0.5800	0.5800
EC6	Restriction	0.6826	0.6826	0.6826
	Legislation	0.3174	0.3174	0.3174
EC7	Restriction	0.4565	0.4565	0.4565
	Legislation	0.5435	0.5435	0.5435
EC8	Restriction	0.5200	0.5200	0.5200
	Legislation	0.4800	0.4800	0.4800
EC9	Restriction	0.5513	0.5513	0.5513
	Legislation	0.4487	0.4487	0.4487
EC10	Restriction	0.3882	0.3882	0.3882
	Legislation	0.6118	0.6118	0.6118

In the context of the ChatGPT ethics conundrum decision-making framework, where ''n'' denotes the quantity of ethical concerns; this study specifically focused on 10 essential ethical considerations associated with the ChatGPT dilemma. The CR is computed by dividing the CI by the RI, with the corresponding RI values provided in Appendix, Table 10.

$$CR = \frac{CI}{RI} \tag{3}$$

To determine the CR, the initial step involves calculating the Lambda max value. This value is obtained through a series of computations: X1 $\times$ X2 = X3, followed by X3 $\div$ X2, resulting in X4. Subsequently, the average of X4 is computed, leading to the determination of Lambda max. The Lambda max value is presented in Table 5, with X2, X3, and X4 values.

Thus, the Lambda max value is presented in Equation 4, follows;

$$\lambda_{max} = 10.1805 \tag{4}$$

The CI is computed using Equation 2, which is expressed in Equation 5:

$$CI = \frac{10.1805 - 10}{10 - 1} = 0.0200556 \tag{5}$$

Similarly, Equation 3 is instrumental in determining the CR, and its representation is provided in Equation 6:

$$CR = \frac{0.0200556}{1.49} = 0.01346 \tag{6}$$

Hence, according to the result obtained, the CR is less than 0.1, which is acceptable [64], [65].

4) POLICY ALTERNATIVES WEIGHTS BASED ON CRITERIA

This section illustrates the evaluation of alternatives concerning individual criteria. The significance level for each alternative is determined on a scale ranging from 1 to 9 points (refer to Appendix, Table 8). The procedures for deriving the criteria weights and calculating their consistency ratios have been previously detailed in the preceding sections, which follow a similar procedure in determining the criteria weight and consistencies for the alternatives. Consequently, Table 6 contains the designated comparison scores for the alternatives (restriction and legislation), for each criterion, along with their corresponding weights.

5) DECISION MATRIX

In this section, the study delves into the computation of the ultimate ranking of alternatives pertaining to the utilization of ChatGPT in the educational sector. Firstly, the ethical concerns are combined to decide on ''restriction'' or ''legislation'' by using the calculated weighted sum of ethical concerns for each policy alternative. Then, assign weights to each ethical concern based on their importance as determined through the AHP. Finally, sum up the weighted scores of all ethical concerns for ''Restriction'' and ''Legislation'' separately. The alternative with the higher weighted sum indicates the preferred choice. Accordingly, the conclusive ranking of policy strategy alternatives, namely restriction and legislation, has been ascertained by amalgamating the calculated weights assigned to the criteria (ethical concerns) and alternatives. The detailed ranking of the policy alternatives, alongside the comprehensive overall ranking computation, is presented in both Table 7 and Figure 6 for clarity and reference. Specifically, Figure 6 contains the overall weights and ranking of the ethical concerns with respect to policy strategy alternatives, showing how the ethical concerns can decide restriction or legislation. According to the result, the restriction policy strategy has a slightly higher value at 51.4% compared to the legislation strategy, which holds 48.6%. This outcome underscores that there is a minimal difference between the two policy strategies. The closeness in percentage values suggests that the choice between restriction and legislation does not significantly alter the overall ranking, with both strategies remaining closely competitive.

D. SUMMARY OF ETHICAL CONCERN RANKING FOR DECISION-MAKING

The ranking of ethical concerns, as depicted in Table 7, serves as a valuable tool for decision-makers to prioritize and address the most pressing issues associated with the utilization of ChatGPT. By assigning weights to each criterion and alternative based on expert assessments and consensus, the decision table provides a systematic framework for evaluating policy alternatives in response to ethical concerns. Specifically, decision-makers can use the rankings to identify which ethical concerns carry the greatest weight and therefore require immediate attention and action. For example, if copyright, legal, and compliance issues receive the highest weight, decision-makers may need to focus on developing policies and procedures to ensure compliance with intellectual property laws and regulatory requirements. Furthermore, the decision table allows decision-makers

TABLE 7. Decision table showing weight of criteria and alternatives.

Criteria ranking			Policy ranking		
Ethical concerns	Weight	Rank	Alternative	Weight	Rank
Copyright, legal, and compliance issues	0.1731	1	Restriction	0.513712	1
Privacy and confidentiality	0.1286	2	Legislation	0.485887	2
Academic integrity concern	0.1206	3			
Incorrect reference and citation practices	0.1111	4			
Safety and security concern	0.1050	5			
Educational equity	0.0958	6			
Plagiarism	0.0828	7			
Infodemics and misinformation	0.0663	8			
Bias response	0.0626	9			
Risk of hallucination through manipulation and mislead	0.0540	10			

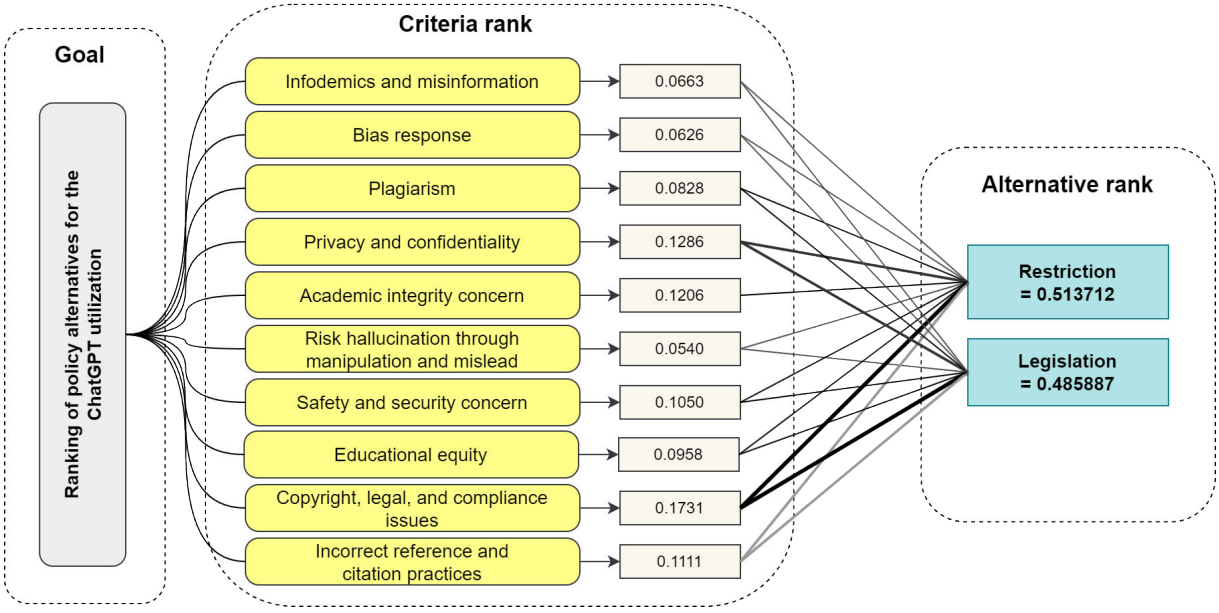

FIGURE 6. Decision-making framework for ChatGPT utilization with policy alternatives.

to compare the relative importance of different policy alternatives in addressing the identified ethical concerns. By examining the weights assigned to each alternative, decision-makers can determine which approach is most aligned with the prioritized ethical concerns and is likely to yield the most favorable outcomes.

V. DISCUSSION

The integration of advanced AI models like ChatGPT in education offers notable advantages, including text summarization and workload reduction for students and academics. However, this innovation also introduces ethical issues, such as privacy issues, potential bias responses, misinformation, and the risk of incorrect citations. Educational stakeholders are confronted with crucial decisions regarding the promotion, discouragement, limitation, or regulation of ChatGPT usage. To address this challenge, the current study introduces an MCDM approach through AHP designed to guide the selection of effective and appropriate policy strategies by incorporating expert input for each criterion and alternative to derive a decision-making framework. The study findings rank these concerns; 1) copyright, legal, and compliance issues (weight = 17.31%), 2) privacy and confidentiality considerations (weight = 12.86%), 3) academic integrity (weight = 12.06%), 4) incorrect reference and citation practices (weight = 11.11%), 5) safety and security (weight = 10.50%), 6) educational equity (weight = 9.58%), 7) plagiarism (weight = 8.28%), infodemics and misinformation (weight = 6.63%), bias response (weight = 6.26%), and risk hallucination through manipulation and misleading information (weight = 5.40%), in this order. Furthermore, the outcome of the proposed model ranks policy strategy alternatives, with restriction slightly favored over legislation. The education stakeholders can use it to navigate the selection of the most appropriate policy strategy, thereby ensuring the responsible and ethical use of ChatGPT. In addition, the study findings hold significance as well as implications and recommendations for policy and practice.

A. SIGNIFICANCE OF THE ETHICAL CONCERNS ON POLICY

Based on the results of the AHP analysis, which prioritized ethical concerns associated with the utilization of ChatGPT, several implications emerge for decision-making

and strategic planning in the educational context. This study further expanded the discussion on the significance of each identified concern within the educational context and its implications for policy-making.

1) COPYRIGHT, LEGAL, AND COMPLIANCE ISSUES

Copyright, legal, and compliance issues encompass a wide range of considerations, including intellectual property rights, licensing agreements, and regulatory compliance [108], [109]. In the educational context, ensuring compliance with copyright laws and licensing agreements is essential to avoid legal disputes and uphold ethical standards [89], [91]. Accordingly, policy development should prioritize the establishment of clear guidelines and procedures for obtaining and using copyrighted materials, including ChatGPT-generated content. Institutions should develop policies that outline acceptable practices for copyright compliance and provide guidance on obtaining appropriate permissions and licenses for using third-party content in educational materials.

Additionally, the recently passed EU AI Act [110] is highly relevant in this context.[2] In light of these developments, educational institutions within the EU and potentially globally should consider aligning their AI-related policies with the provisions of the EU AI Act. This alignment includes adhering to risk-based guidelines for AI applications, ensuring AI systems are safe and trustworthy, and respecting fundamental rights. Institutions must also navigate the exemptions provided by the AI Act, ensuring their educational AI applications comply with the new regulations while promoting innovation and protecting intellectual property rights.

2) PRIVACY AND CONFIDENTIALITY CONSIDERATIONS

Privacy and confidentiality considerations involve protecting sensitive information and safeguarding user privacy [96], [111] when interacting with ChatGPT platforms. In educational settings, ensuring the privacy and confidentiality of student data is paramount to comply with data protection regulations and maintain trust with stakeholders. Accordingly, policy development should focus on implementing robust privacy policies and security measures to protect user data and ensure compliance with data protection laws. Institutions must establish procedures for obtaining informed consent from users and provide transparency regarding data collection, storage, and usage practices.

[2]The EU AI Act aims to harmonize rules on AI by following a 'risk-based' approach, meaning the higher the risk of harm to society, the stricter the rules. As the first AI Act globally, the legislation can set a global standard for AI regulation. The Act is designed to foster the development and adoption of safe and trustworthy AI systems across the EU's single market by both private and public actors, exempting systems used exclusively for military, defense, and research purposes. It also aims to ensure respect for the fundamental rights of EU citizens while stimulating investment and innovation in artificial intelligence in Europe.

3) ACADEMIC INTEGRITY

Academic integrity encompasses honesty, fairness, and ethical behavior in academic settings, including the proper attribution of sources and the avoidance of plagiarism [21], [30], [93], [100]. Therefore, upholding academic integrity is essential to maintain the credibility and reputation of educational institutions and foster a culture of ethical conduct among students and educators. Policy development should emphasize the importance of academic integrity and outline clear expectations regarding proper citation practices and ethical conduct. Institutions must develop policies that prohibit plagiarism and academic dishonesty, as well as provide resources and support services to promote responsible research and writing practices.

4) INCORRECT REFERENCE AND CITATION PRACTICES

Incorrect reference and citation practices involve inaccurately attributing sources or failing to provide proper credit to the original authors [31], [33], [35], [89]. Thus, ensuring accurate and ethical citation practices is essential to uphold academic integrity and avoid unintentional plagiarism [21]. In this case, the policy development should address the importance of accurate referencing and citation practices and provide guidance on proper citation formats and conventions. Institutions must educate students and educators about the consequences of incorrect referencing and implement measures to detect and prevent plagiarism effectively.

5) SAFETY AND SECURITY

Safety and security concerns involve protecting users from harm and ensuring the integrity and reliability of ChatGPT platforms [20], [32], [96]. In educational settings, ensuring the safety and security of students and educators is paramount to create a conducive learning environment free from threats and risks. As a result, policy development should prioritize the implementation of technological safeguards and security measures to protect users from potential risks, such as cyberattacks, data breaches, and malicious activities. Institutions must develop policies that address cybersecurity threats and provide guidelines for reporting security incidents and breaches.

6) EDUCATIONAL EQUITY

Educational equity involves ensuring fairness and equal access to educational opportunities and resources for all students, regardless of their background or circumstances [37], [99]. In educational settings, promoting educational equity is essential to address disparities in access to technology and resources and ensure that all students have the opportunity to succeed. Therefore, policy development should prioritize strategies for promoting educational equity and addressing barriers to access for marginalized and underserved student populations. Institutions must develop policies that provide equitable access to ChatGPT technologies and support services for students with diverse needs and backgrounds.

7) PLAGIARISM

Plagiarism involves the unauthorized use or reproduction of someone else's work without proper attribution, which undermines academic integrity and intellectual property rights [21], [29], [30], [31], [34], [89]. Accordingly, preventing plagiarism is essential to uphold ethical standards and maintain the credibility of academic work. Policy development should focus on implementing measures to prevent and detect plagiarism, such as plagiarism detection software, academic honesty policies, and educational interventions. Institutions must educate students about the consequences of plagiarism and provide resources and support services to promote responsible writing and research practices.

8) INFODEMICS AND MISINFORMATION

Infodemics and misinformation involve the spread of false or misleading information [29], [35], [92], [94], which can have effects on decision-making and public discourse. Therefore, combating infodemics and misinformation is essential to promote critical thinking skills and information literacy among students. The policy development should prioritize strategies for addressing infodemics and misinformation, such as promoting media literacy education and fact-checking initiatives. Institutions must develop policies that encourage critical thinking and evidence-based reasoning and provide resources for students to evaluate the credibility and reliability of information sources.

9) BIAS RESPONSE

Bias response involves addressing biases and prejudices that may influence decision-making and behavior [31], [89], [92], [96]. Hence, addressing bias response is essential to create an inclusive and equitable learning environment that values diversity and promotes respect for all individuals. Policy development should focus on implementing strategies for addressing bias response, such as bias awareness training, cultural competency programs, and diversity initiatives. Institutions must develop policies that prohibit discriminatory behavior and provide mechanisms for reporting and addressing bias incidents effectively.

10) RISK HALLUCINATION THROUGH MANIPULATION AND MISLEADING INFORMATION

Risk hallucination through manipulation and misleading information involves distorting perceptions of risk through the manipulation of information and misinformation [89], [90], [91], [95]. Thus, addressing this concern is essential to promote informed decision-making and mitigate the spread of false or misleading information. Policy development should prioritize strategies for addressing risk hallucination through manipulation and misleading information, such as promoting media literacy education and critical thinking skills. Institutions must develop policies that encourage skepticism and vigilance when evaluating information sources and provide resources for students to discern credible information from misinformation.

B. RECOMMENDATIONS AND POTENTIAL STRATEGIES

The prioritized ethical concerns identified through the AHP analysis provide valuable insights for decision-making and strategic planning regarding the utilization of ChatGPT in education. The study makes some recommendations based on the outcome obtained in this study. For example, there is a greater need to involve educators, students, parents, policymakers, and technology experts in discussions about the role of Gen-AI in education, to gather diverse perspectives to inform a well-rounded decision-making process. Secondly, it is crucial to implement pilot programs and experiments to assess the impact of Gen-AI in educational settings, especially on students' critical thinking abilities. This can only be possible through credible research studies to understand the effectiveness, challenges, and ethical considerations associated with the use of Gen-AI in specific educational contexts. Thirdly, this study add to the existing calls towards developing clear and ethical guidelines for the use of Gen-AI in education [28], [56], [57].

Effective ethical guidelines to help in establishing standards that prioritize student privacy, security, and the enhancement of the learning experience. Moreover, in the case that Gen-AI's are to be regulated, it is important to consider flexible regulatory frameworks that can adapt to the evolving landscape of technology in education, i.e., to void overly restrictive measures that may stifle innovation, while still addressing potential risks, considering a resilience aspect [40] to the adoption of ChatGPT and overall Gen-AI models. Regularly reassessing the importance of regulations or restrictions based on emerging evidence and changing technological landscapes is crucial. Finally, conduct awareness campaigns to inform stakeholders about the benefits and risks of using Gen-AI in education, while promoting a shared understanding of the role that Gen-AI can play in enhancing learning outcomes. Nevertheless, the study offers examples of potential strategies for addressing the identified ethical concerns associated with the utilization of Gen-AI. By exploring these potential strategies, based on policy development, technological safeguards, and educational interventions, institutions can have an idea of how to foster ethical and responsible use of ChatGPT while promoting equitable learning opportunities for all students.

1) EXAMPLE OF STRATEGIES FOR POLICY DEVELOPMENT

- Establish clear guidelines and policies regarding the ethical use of ChatGPT in educational settings, addressing concerns such as copyright infringement, legal compliance, and privacy protection.
- Develop institutional policies that outline acceptable practices for referencing and citation when utilizing ChatGPT-generated content, emphasizing the importance of proper attribution and intellectual property rights.
- Implement policies to ensure compliance with relevant regulations, such as data protection laws (e.g., GDPR, COPPA, EU AI Act) and intellectual property rights

legislation, to safeguard user privacy and mitigate legal risks.
- Regularly review and update policies in response to evolving ethical considerations and regulatory requirements, ensuring alignment with best practices and industry standards.

2) EXAMPLE OF STRATEGIES FOR TECHNOLOGICAL SAFEGUARDS

- Integrate technological safeguards into ChatGPT platforms to detect and prevent unethical behavior, such as plagiarism, incorrect referencing, and misuse of copyrighted material.
- Implement encryption and data anonymization techniques to protect user privacy and confidentiality when interacting with ChatGPT, ensuring that sensitive information remains secure.
- Develop algorithms and tools for content verification and authenticity verification to mitigate the spread of misinformation and ensure the accuracy and reliability of ChatGPT-generated content.
- Utilize machine learning algorithms to continuously monitor and assess user interactions with ChatGPT, flagging potential ethical violations and providing real-time feedback to users.

3) EXAMPLE OF STRATEGIES FOR EDUCATIONAL INTERVENTIONS

- Offer training and educational programs for students, educators, and administrators on the ethical use of ChatGPT, covering topics such as copyright laws, citation practices, and data privacy.
- Incorporate modules on digital literacy and responsible AI usage into the curriculum, educating students about the ethical considerations and societal implications of using ChatGPT in academic and professional contexts.
- Foster a culture of academic integrity and ethical conduct through awareness campaigns, workshops, and seminars, promoting values such as honesty, integrity, and respect for intellectual property rights.
- Encourage collaborative learning and peer-to-peer feedback mechanisms to cultivate a community of responsible users who uphold ethical standards and support one another in navigating ethical dilemmas related to ChatGPT usage.

C. GENERALIZATION OF THE DECISION-MAKING FRAMEWORK

In addition to analyzing the ethical concerns surrounding the utilization of ChatGPT in educational settings, this study also offers a structured Decision-making Framework that can be generalized to assess the integration of other Gen-AI models in education. While the focus of this paper has been on ChatGPT, the principles and methodology employed in developing the framework can be extended to evaluate the ethical implications of various AI technologies utilized in educational environments, given that a significant portion of the respondents are individuals working within higher institutions. It is noteworthy to acknowledge that the framework outlined in this paper encompasses several key steps that can be replicated and adopted.

First, the ethical concerns were selected through a systematic review process, a less biased, more dependable, and more precise synthesis [68] of ethical concerns. This involves identifying and cataloging the ethical concerns associated with the implementation of a specific AI model, such as ChatGPT, in education. This comprehensive review serves as the foundation for understanding the landscape of ethical considerations. Second, frequency analysis was used to identify the most frequent ethical concerns identified in the systematic review. This step ensures that attention is directed towards addressing the most prevalent and impactful ethical issues. Third, the AHP methodology is employed to further refine the frequent ethical concerns. By engaging a panel of experts and assigning weights to each concern, a hierarchical structure is established to facilitate decision-making regarding policy alternatives. The final step involves evaluating policy alternatives, such as restriction or legislation, in light of the prioritized ethical concerns.

This evaluation provides insights into the most appropriate regulatory approach for mitigating ethical risks associated with the utilization of Gen-AI in education. By following this Decision-making Framework, educational institutions and policymakers can systematically assess and address the ethical implications of integrating AI technologies into educational settings. While this study focuses on ChatGPT as a case study, and particularly in higher education, the framework can be adapted to evaluate other Gen-AI models as well as other educational institutions, ensuring a comprehensive and standardized approach to ethical decision-making in the realm of AI-driven education.

D. LIMITATION AND FUTURE WORK

The study is not without limitations, which opens up a gap for future research. Firstly, the study noted that the close similarity in weights between ''Restriction'' and ''Legislation'' suggests that both options are perceived as relatively balanced or equally likely in the context of Gen-AI in education. This result underscores the need for careful consideration and an effective approach when deciding whether to restrict or legislate Gen-AI in education. Accordingly, the similarity in weights indicates that there may be arguments for and against both restriction and legislation. This suggests that stakeholders have diverse views, and a one-size-fits-all approach may not be suitable. Similarly, the issue of regulating Gen-AI in education is complex, and there is no clear consensus on the best course of action. Therefore, the decision-making process should take into account various factors, such as the benefits or rewards of Gen-AI, potential risks [40], and the educational context. Moreover, further analysis is required to understand the specific concerns and benefits associated with Gen-AI in education. Stakeholders should engage in detailed

TABLE 8. The AHP scale based on Saaty [84], [85].

Score	Meaning	Explanation based on this study
1	Equal	Two ethical concerns are equally important
2	Weak important	One ethical concern is weakly important from the other
3	Moderate important	One ethical concern is slightly preferred over the other
4	Moderate plus	One ethical concern is moderately important from the other
5	Strong important	One ethical concern is strongly preferred over the other
6	Strong plus	One ethical concern is more stronger than the other
7	Very strong	One ethical concern is very strongly preferred over the other
8	Very, very strong	One ethical concern is very very stronger than the other
9	Absolute important	One ethical concern is absolutely more important from the other

TABLE 9. The profile of the respondent.

Expert Code	Affiliation	Specialization	Experiences
EP1	Department of Information and Communication Engineering, Basra University College of Science and Technology, Basra, Iraq, Faculty of Computing; Universiti Teknologi Malaysia, Kuala Lumpur, Johor, Malaysia.	Wireless Networking, Routing Protocols, mobile and vehicular ad hoc networks.	12 years
EP2	University of Basrah, Basrah 61001, Iraq, School of Computing, College of Arts and Sciences; Universiti Utara, Malaysia, Kedah, Malaysia	Software Engineering, Mobile Systems, Information Systems, Persuasive Technology, Human computer Interaction	9 years
EP3	Faculty Fellow of Marketing and Management, SC Johnson College of Business and Cornell Tech, Cornell University, USA, Department of Electrical and Computer Engineering, Texas Tech University, Lubbock, TX 79409, USA.	Machine Learning, Multimodal Learning, Privacy, Generative Models, Computer Vision, Digitization.	10 years
EP4	School of Computer Science and Technology, Huazhong University of Science and Technology, Wuhan, 430074, China.	Security and privacy issues in VANETs and WSNs, Computer network security, Internet of Things, Cloud computing, Intelligent transportation systems, Invasive software, Computer crime, Information systems, Data analysis.	13 years
EP5	Southern Technical University, Iraq, Assistant Chief IT Engineer, Missan Oil Company, Iraq; University of Tennessee, Knoxville, USA.	Computer Engineering, Computer Networks, Wireless Telecommunications, Mobile Computing, Machine Learning, Deep Learning.	15 years
EP6	Department of Information and Communication Engineering, Basrah University College of Science and Technology, Basrah, Iraq.	Wireless Communications, Propagation, MIMO, Wireless Sensor Network, Signal Processing.	14 years
EP7	Department of Industrial Management, College of Vocational Study, IPB University, Bogor, Indonesia.	Management, Information Systems (Business Informatics), AHP, Fuzzy AHP, MCDM.	7 years
EP8	College of Graduate Studies, Universiti Tenaga Nasional (UNITEN), Kajang 43000, Malaysia.	Information Technology, Technology Adoption, Information Systems, Acceptance of Emerging Technologies, Internet of Thing, MCDM.	4 years
EP9	School of Computer Science (CS), Taylor's University, Subang Jaya 47500, Malaysia.	Cloud Computing, Computer Applications, Management System, Load Balancing Teaching, Machine Learning, Data Analytics.	7 years
EP10	Department of Information Technology, Modibbo Adama University of Technology Yola, Yola 640231, Nigeria, Department of Communication and Networking, Universiti Putra Malaysia, Seri Kembangan 43400, Malaysia.	Task scheduling in cloud computing, Computer Networks, ICT.	10 years
EP11	Industrial Management, College of Vocational Studies IPB University	Lecturer in Logistics and supply chain management.	5 years
EP12	Industrial Management, College of Vocational Studies IPB University	Management, Information Systems (Business Informatics), AHP.	3 years

TABLE 10. Predefined value of the random index (RI).

N	1	2	3	4	5	6	7	8	9	10	11	12	13
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.58	1.56

discussions and gather comprehensive data before making any decisions.

Nonetheless, the decision to restrict or legislate Gen-AI in education should be approached with a careful balance of perspectives, considering the complex nature of the issue. A collaborative and research-driven approach will help in formulating informed policies that maximize the benefits of Gen-AI while addressing potential concerns. To further streamline the decision-making process, it is important to transform the developed MCDM model into an online tool as suggested and implemented in previous research [80], [112]. This can be achieved by utilizing a programming language like Javascript, to facilitate calculations based on inputs from decision-makers or users, including weight calculation of ethical concerns and policy alternatives, ultimately generating rankings. This tool aims to assist policymakers in making informed decisions regarding ChatGPT usage. Additionally, future studies could extend the scope of the MCDM model proposed in this study by incorporating additional alternative options or exploring different MCDM approaches,

such as Fuzzy AHP, Fuzzy logic, and Analytic Network Hierarchy (ANP). These advancements would contribute to a comprehensive and adaptable decision-making framework in the evolving landscape of AI in education.

Furthermore, while this study presents a framework and offers an illustrative example of its application, it is essential to acknowledge other limitations that may impact the generalizability of the findings. One notable limitation concerns the composition of the respondent pool, which primarily consists of experts specializing in IT or computer science. Future research endeavors could benefit from the inclusion of academics with backgrounds in humanities or other non-IT disciplines, as well as experts from industry experience, geographical diversity, and emerging researchers. This broader representation of expertise would enable a more holistic examination of the framework's applicability and may yield more insights into its implications across different domains. Therefore, while this study provides valuable insights within the scope of IT expertise, caution should be exercised when extrapolating the findings to contexts outside this domain.

VI. CONCLUSION

This study has provided insights into the ethical concerns and policy strategies associated with the utilization of ChatGPT in educational settings. Through the application of the AHP, this study have identified and prioritized ten key ethical concerns, including copyright, legal, and compliance issues; privacy and confidentiality considerations; academic integrity; incorrect reference and citation practices; safety and security; educational equity; plagiarism; infodemics and misinformation; bias response; and risk hallucination through manipulation and misleading information. Accordingly, the study proposed a decision-making framework, based on identified ethical concerns, to serve as a tool for government authorities and policymakers. The outcome of the proposed model ranks policy strategy alternatives, with restriction slightly favored over legislation. Accordingly, this study considered the implications of these conclusions for educational institutions and policymakers. Firstly, the decision-making framework allows for the comprehensive evaluation of the education sector before making decisions related to ChatGPT implementation, considering the most relevant ethical considerations. Hence, educational stakeholders can use it to navigate the selection of the most appropriate policy strategy, thereby ensuring the responsible and ethical use of ChatGPT.

Moreover, the findings of the study underscore the complexity and multifaceted nature of ethical considerations surrounding the integration of ChatGPT into educational practices. Addressing these concerns requires a holistic approach that encompasses policy development, technological safeguards, and educational interventions. Policy development should focus on establishing clear guidelines and procedures for copyright compliance, protecting user privacy, promoting academic integrity, and addressing bias and misinformation. Technological safeguards, such as encryption, data anonymization, and plagiarism detection software, are essential for ensuring the safety and security of users and preventing unethical behavior. Educational interventions play a crucial role in fostering a culture of ethical conduct and responsible use of ChatGPT among students, educators, and administrators. By incorporating modules on digital literacy, academic integrity, and critical thinking into the curriculum, institutions can equip individuals with the skills and knowledge needed to navigate ethical dilemmas effectively. Overall, this study contributes to the ongoing dialogue surrounding the ethical implications of ChatGPT in education and provides a foundation for future research and policy development in this area. By addressing these ethical concerns proactively, we can harness the potential of Gen-AI to enhance teaching and learning while safeguarding the integrity and ethical principles of education.

APPENDIX

Refer to Table 8 for the AHP scale based on Saaty [84], [85], Table 9 for respondent profile, and Table 10 for the Saaty's [84], [85] predefined random index.

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