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Ethical concerns for using artificial intelligence chatbots in research and publication: Evidences from Saudi Arabia

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Abstract

Artificial intelligence (AI) conversational generative chatbots have drawn the attention of academics and have been increasingly used in the scientific research process since the inauguration of ChatGPT in November 2022. Despite growing research on AI chatbots' usage in research and publication, limited studies have deeply addressed the ethical concerns that arise from their usage. This research explores the perceptions of academics and their leaders regarding the use of AI chatbots in research and publication. It addresses the ethical dilemma and ethical approaches considered by academics and their leaders for shaping their decisions for the use or non-use of chatbots in scientific research. For these purposes, in-depth interviews were conducted with 21 academics/researchers and 11 leaders of scientific research in public universities in Saudi Arabia. The results of the thematic analysis confirmed that AI chatbots are extensively used in scientific research, albeit many researchers present their publications as their own work with no acknowledgement of the support from chatbots. The results showed ten interrelated ethical concerns, which would impact the growth of pseudoscience in developing countries if these concerns were not overcome. Hence, strategies for mitigating these ethical concerns are suggested. The research showed that academics often use chatbots based on a "utilitarian" approach, whereas most leaders consider the "virtue" or the "common good" approach for their concerns about chatbot adoption in scientific research. This research calls for policy and interventions from policymakers and other stakeholders about the responsible and ethical use of chatbots in research and publication.

Introduction

Chatbots go back to the 1960s when Joseph Weizenbaum developed the initial chatbot called ELIZA in 1966 (Weizenbaum, 1966). However, it was criticized because of limited knowledge and its inability to keep lengthy conversations and extract meaning from conversations. This was followed by updated chatbots such as PARRY in the 1970s, which addressed the shortcomings of ELIZA. It was more advanced and had a more controlling structure (Colby et al., 1972). More improvements were undertaken in chatbots after the integration of artificial intelligence in chatbots in the 1990s, introducing ALICE "Artificial Linguistics Internet Computer Entity", which relied on pattern matching, albeit it could not generate human-like responses (Heller et al., 2005). By 2000, chatbots were enhanced further to assist people in their daily activities and became available on Messengers such as Microsoft MSN. Thus, users were able to retrieve information from databases regarding news, weather and sports. This was recorded as a noteworthy improvement in human-computer interaction by gaining information from chatbots about daily activities (Adamopoulou & Moussiades, 2020). Voice assistance was then added to facilitate the use of chatbots and make voice commands, such as Google Assistant and Apple Siri (Adamopoulou & Moussiades, 2020).

Artificial intelligence (AI) conversational generative chatbots have witnessed a substantial transformation since November 2022 when ChatGPT was launched. ChatGPT has its place with the generative pre-trained transformer created by the American AI research lab OpenAI. OpenAI introduced ChatGPT as a fine-tuned, eco-friendly large language model (LLM), which can respond to numerous conservational prompts (OpenAI, 2022). Therefore, ChatGPT had one million users in the first five days and 100 million users in a few months. This made it the quickest-rising technology in history (Li, 2024). It continues to grow and reached over 180 million users in October 2023 (Li, 2024). ChatGPT has opened the door for several other recent AI chatbots, such as Google Bard (now Gemini), Bing Chat, and Ernie, which were developed to serve the needs of users for several purposes (Rudolph et al., 2023).

AI generative chatbots have drawn the interest of academics in higher education, and many of them started using this technology from day one (AI Lily et al., 2023; Al-Abdullatif, 2023; Lo, 2023). Rudolph et al. (2023) expected a "war of chatbots" for years to come, which is also anticipated to have a significant impact on higher education. Similarly, Hasanien and Sobaih (2023) predicted that the use of chatbots would have a massive impact on academic performance in higher education. Several scholars (see for example, Rudolph et al., 2023; Hasanien & Sobaih, 2023; Xames & Shefa, 2023; Ifelebuegu et al., 2023) have predicted a great change in higher education after the incorporation of AI chatbots. Chatbots were adopted for numerous purposes in higher education, e.g. academic writing, manuscript preparation, literature review, language editing, language translation, and statistical and data analysis (Hasanien & Sobaih, 2023; Gonsalves, 2023; Ifelebuegu et al., 2023; Joseph et al., 2024; van Dis et al., 2023; Xames & Shefa, 2023).

In the scientific research context, there was an increasing consideration from scholars about AI chatbot usage in scientific research (e.g. Hasanien & Sobaih, 2023; Gill et al., 2024; Manigandan & Sivakumar, 2024; Salvagno et al., 2023; Xames & Shefa, 2023). Previous research noted several benefits for the use of chatbots throughout the research life cycle for researchers (who undertake the research process and keenly disseminate it to other scholars or researchers), reviewers (who undertake the review process and judge the quality of submitted research) and editors (who make the decision about acceptance or rejection of publication based on certain criteria). However, some concerns were also noted in relation to authorship, referencing, academic integrity, plagiarism, information accuracy, copyright, privacy, transparency, and potential misuse of personal data (Chaka, 2023; Michel-Villarreal et al., 2023; Xames & Shefa, 2023). Despite these concerns, Xames and Shefa (2023) were optimistic about the use of scientific research in the near future. Hence, they argued that if these challenges were met, then AI generative chatbots would have a significant positive impact on scientific research.

Recent research on AI chatbot use in education, including scientific research (Rudolph et al., 2023; Hasanien & Sobaih, 2023; Xames & Shefa, 2023; Gill et al., 2024; Manigandan & Sivakumar, 2024) focused on exploring the perceptions and benefits of its adoption, drawbacks, or deficiencies in this technology. Ethical concerns for the use of AI chatbots were explored in general (Stahl & Eke, 2024). Recent studies (e.g. Popenici, 2023; Hasanien & Sobaih, 2023) have stressed that both scholars and higher education leaders must consider the ethical and intellectual implications of AI in education and research. However, to the best of my knowledge, there is no published research to date that investigated how the ethical decisions of users are shaped regarding the incorporation of AI chatbots in education and research. A previous study undertaken by Hasanien and Sobaih (2023) found that faculty and their students were more interested in the use of ChatGPT in education to support their study or work objectives, such as assignment preparation, language editing, translation, exam preparation and data analysis. In contrast, higher education leaders were more concerned about its use in education. Their concern was mainly because of its expected negative impact on learning outcomes, especially in the long term, such as critical thinking and other students' skills. This means that each key stakeholder has their own reasons or justification for their decisions. Notwithstanding this, it is important to understand how this decision meets ethical standards. What ethical approach was followed when making such a decision? How can it be enhanced to sufficiently consider the ethics and values of higher education in general and scientific research in particular? This research tries to answer these research questions. The research explores the perceptions of both academics and their leaders about AI chatbot usage in scientific research and their responses to the ethical dilemma of its use or non-use in scientific research. It explores ethical issues arising from the use of AI chatbots and ethical approaches considered by academics for shaping their decisions in the use or non-use of chatbots in scientific research. It is expected that a proper understanding of these concerns enables higher education to make the best use of technology in education and research, particularly AI chatbots.

Literature review

Chatbot use in scientific research

Since the launch of ChatGPT by the end of 2022, studies on the prospects and challenges for the use of AI chatbot in science and research are on the rise (Xames & Shefa, 2023; van Dis et al., 2023; Manigandan & Sivakumar, 2024; Kooli, 2023). Examples of these recent studies include the use of ChatGPT in research and publication (Xames & Shefa, 2023; Manigandan & Sivakumar, 2024; Salvagno et al., 2023). There was also a plethora of studies on the use of certain AI chatbots for various reasons, e.g. the use of "Quokka" chatbots for material science (Yang et al., 2024b); the use of "PLLaMa" chatbots for plant science (Yang et al., 2024a). Besides their use in education and research, AI chatbots were extensively used for other purposes, e.g. healthcare (Wang et al., 2023), cultural value proposition (Iodice et al., 2024), and banking and customer service (Le & Nguyen, 2015). There was also a plethora of studies (Rudolph et al., 2023; Waisberg et al., 2023; Ram & Pratima Verma, 2023; Cheong et al., 2023; Aiumtrakul et al., 2023) which focused on a comparison between various AI chatbots, i.e. ChatGPT, Bard, Bing, Baidu's Ernie, and their countless advantages and usages in different fields, particularly in education.

Regarding scientific writing and publication, most studies often focus on the opportunities of chatbots. For instance, Chen (2023) found that ChatGPT is beneficial for translation from Chinese to English. The same author found that ChatGPT is a great supporting tool in academic writing. However, Aydin and Karaarslan (2022) noted that the use of ChatGPT in writing could develop inadequate paraphrasing and plagiarism. Xames and Shefa (2023) reported several benefits of the use of ChatGPT in research and publication for researchers, editors and academics. For researchers, it could support them throughout the process of research writing and publication for the generation of ideas, the preparation of the manuscript, data generation and analysis, writing of the manuscript to full publication of the manuscript and language editing (Kim, 2023). It supports research in selecting the appropriate journal for publication and responding to incomprehensible comments made by reviewers. In addition, both editors and reviewers can make beneficial use of chatbots by making the right decisions about the submitted research and gaining more insights about it. AI chatbots can help both editors and reviewers make appropriate decisions about the manuscript and its revised version(s) (Xames & Shefa, 2023).

The ethical dilemma of chatbot use in scientific research

Despite the well-documented opportunities for the use of chatbots in research and publication, a number of drawbacks or concerns were also noted (Hasanien & Sobaih, 2023; Xames & Shefa, 2023; Michel-Villarreal et al., 2023). These concerns are connected to the ethics of integrating AI into education and research. The first concern was associated with the authorship of chatbots (Lee, 2023; Lund & Naheem, 2023), like ChatGPT, in scientific publications since they have substantial contributions to the research. The question of "Can chatbots be considered a co-author in research?" remains controversial to date (Xames & Shefa, 2023; Liebrenz et al., 2023). Some publishing bodies, such as Nature and Science, rejected the chatbots' co-authorship because they are not human beings and cannot take responsibility for their writing. In addition, copyright issues do not meet the current legal system (Kooli, 2023). Despite this, some articles were published with ChatGPT as a co-author (e.g. O'Connor & ChatGPT, 2022). Chatbots' co-authorship is also connected to copyright issues, accountability, and fairness. The question "Who holds the copyright for the text produced by chatbots?" remains unanswered and raises a concern about who the real co-author of the produced information is) Xames & Shefa, 2023(. In this case, who holds the legal responsibility is a key concern that should be addressed (Wang et al., 2023).

Another major ethical concern that emerged from the use of chatbots is the increasing risk of plagiarism and inaccuracies in research (Salvagno et al., 2023). Chatbots work on the data they were trained on, and hence, the responses taken from chatbots could be biased, inaccurate or have unintentionally plagiarized work because of algorithm bias. Chaka (2023) examined the accuracy of five AI content tools "GPTZero, OpenAI Text Classifier, Writer.com's AI Content Detector, Copyleaks AI Content Detector, and Giant Language model Test Room" to detect AI-generated text. The same author found that the five AI detectors were not efficient enough; hence, contribute to AI-generated plagiarism in publications. This opens the door for the growth of "pseudoscience" (Xames & Shefa, 2023). However, this sort of junk science could find room for publication in predatory publishers and their predatory journals, which do not rely on a solid peer-review process. Chaka (2024) recommended adopting contemporary AI detectors with traditional anti-plagiarism tools to ensure that the generated contents are human-written texts. It is not easy to differentiate between real and fake information without the eye of an expert in the field of science. Xames and Shefa (2023) revealed that ChatGPT, as the most common chatbots, has the tendency to suggest references that do not really exist. This raises a major concern about the validity and credibility of collected information from chatbots. It also raises another concern about the integrity of scientific research (Rudolph et al., 2023; Hasanien & Sobaih, 2023).

As discussed previously, chatbots rely on the scope and quality of the data they were trained on (Rudolph et al., 2023). Therefore, some chatbots, such as ChatGPT, were trained on data until 2021; hence, the gathered information may not be up to date or have a trainer bias (OpenAI, 2022). Although other chatbots, such as Google's Bard (now Gemini) and Bing Chat, are more updated, there are some concerns about inaccuracies of collected information from these sources that need human validation before full consideration of use in research (Rudolph et al., 2023). Another ethical concern is the fairness and equality in accessing information from chatbots as they are becoming paid services. However, many users from low-income nations will have limited access to these services (Salvagno et al., 2023). This imbalance in the service provision raises the digital gap between developed and developing countries, which is certainly not for the sake of research and science development (Xames & Shefa, 2023).

Methodology

The research approach

The study undertook a phenomenological approach to explore the decision of academics and their leaders about the use of chatbots in the scientific research process (Cilesiz, 2011). This kind of research approach helps the researcher/s delve deep into the experiences of academics, researchers, and leaders of scientific research. It helps in understanding how their decision about the use or non-use of AI chatbots in scientific research was formed (Neubauer et al., 2019). This study draws on the experience of academics in their use of chatbots and explores the ethical considerations relating to AI chatbot usage in their research and publication. This research approach also gave enough information about the perceptions of leaders of scientific research regarding the incorporation of chatbots in research and publication, especially how their decision is made and the ethical implications of their decisions.

Data collection and sampling

The data were gathered from academics and leaders of scientific research in a sample of Saudi Arabian public universities. The data was collected from 21 academics and 11 leaders of scientific research who were deans and vice deans of scientific research in Saudi universities. Interviewees were accessed through personal networks at the different universities. This sample of research interviewees was adequate to reach data saturation (Fusch & Ness, 2015). There was slightly more participation from male academics (57 %) than females (43 %). Participants were nearly equally distributed to health sciences (23.8 %), engineering and computer sciences (23.8 %), agricultural and environmental sciences (23.8 %), and social sciences and humanities (28.6%). All the ethical issues were fully respected and adopted during the research process. This includes gaining approval from the authorized committee and interviewees' consent before the beginning of data collection, as well as hiding their name and identity (codes were used instead of name and job title) to protect their privacy.

Data analysis

The interviews were voice-recorded or note-taken and transcribed after the interviews. This research used a thematic analysis for processing and analyzing the data (Braun & Clarke, 2012). Interesting points of data were coded, and themes were generated from the transcribed data. Three themes were developed. First, ethical concerns relating to chatbot usage in research and publication. Second, ethical decisions are made to use or not use chatbots in scientific research. Third, how ethical concerns relating to AI chatbot usage could be minimized and sorted.

Results

Theme 1: Ethical concerns relating to chatbot usage in research and publication

In-depth interviews with both academics and leaders of scientific research showed great value for chatbot use in research and publication. However, interviewees commented on ten key ethical concerns related to chatbot usage in research and publication. These ten concerns are privacy and confidentiality concerns, bias and inaccuracy of information, accountability and responsibility, authorship and licensing concerns, fairness and data accessibility, hallucinations concerns, recency of information, validation concerns, emergence of pseudoscience, and absence of human skills (see Table 1).

Table 1. The ten ethical concerns relating to chatbot usage in research and publication.

Concerns	Short description
1. Privacy and confidentiality	Collection of personal data by chatbots, which may be misused or unauthorized and accessed by third party, is a threat to users' privacy. Current privacy regulations do not fully fit with AI chatbots. The absence of a clear policy for personal data processing is a concern for confidentiality.
2. Bias and inaccuracy	Chatbots depend on the data they are trained with, and the techniques adopted by creators. Training data and techniques adopted by creators in chatbots could lead to biased and inaccurate information.
3. Accountability and responsibility	The quality of information relies on the developers or system creators who have to be accountable and act responsibly. Users also have to use this tool responsibly and recognize its drawbacks when using the information generated by chatbots.
4. Authorship and licensing	The authorship of outputs is a major concern. Who owns the authorship (e.g. system creators, users or chatbots themselves) or have the copyright and licenses of the outputs generated by chatbots.
5. Fairness and data accessibility	Researchers who are familiar with technology and those who could pay for some paid chatbots have more access to chatbots than other colleagues in many developing countries raising a concern about equality and fairness.
6. Hallucinations of chatbots	Chatbots produce hallucinations, including fake or inaccurate citations and unintentional plagiarism, which cannot be easily identified by many software.
7. Recency of information	Some chatbots provide data that is not up-to-date and may have algorithm bias. This raises concern about data accuracy and recency of information used.
8. Validation of information	Another key concern is the validity of generated information. The outputs of chatbots are not 100 % accurate and require expert assessment and validation before consideration in research or publication
9. Lack of human skills	Extensive use of technology, AI and chatbots has a negative effect on human interaction and interpersonal skills and may lead to self-isolation. Some interviewees were concerned about mental health because of the intensive use of chatbots.
10. Emergence of pseudoscience	The spread of inaccurate and biased chatbots' outputs without proper peer review in predatory journals and online rise pseudoscience sciences. Other scholars could build their work on this wrong information, which would raise a concern about the future of science.

The first concern raised by interviewees was related to the possibility of gathering personal data and chat history by chatbots. Interviewees were worried that their information may be misused, possibly for cyberattacking. The probability of using information of users in any purposes by chatbots or third party without their approval raises an important concern about chatbot usage in research and publication. This concern has also a legal aspect relating to data protection. It was argued that the current legislations and regulations related to data protection and privacy do not fit with AI and require an update to consider these aspects. Some comments about this issue are:

> I am so worried about my personal data and searching history. They could be linked together and misused [Res12].

> As I know, there is no national policy that addresses AI usage in education and re-search. Confidentiality of our researchers is a key concern for chatbot use in scientific research [Lead4].

The second concern was associated with bias and inaccuracy of output due to the bias and inaccuracy from data used to train the chatbots or the techniques adopted by system developers, which may lead to inaccurate and biased data. Interviewees have experienced wrong information generated by chatbots that are inaccurate and argued that they need validation before consideration in research or publication. Interviewees from all backgrounds, i.e. different disciplines, confirmed that they had found inaccurate data generated by chatbots, and hence, they raised a concern about data bias and inaccuracy. As one of the researchers from social science commented:

> I have experienced several outputs that are not true. For instance, in my recent search, I found wrong assumptions about one of theories …. that has been updated but the output gave me the old assumption about this theory [Res14].

Another researcher [Res12] commented on the bias of the ChatGPT questioning, "Have you tried to debate with ChatGPT and assume that you are right, and the output is wrong?" He then answered himself and said, "I have done this a couple of times and ChatGPT changed the answer". This raises a concern about the accuracy of outputs that would be used to build scientific research and publication.

The third concern was related to the accountability and responsibility of both creators and users or academics, who must be responsible in their creation and usage of this supporting tool. Accountability of the system creators is a major ethical concern regarding the quality of output by chatbots. The quality of information used in scientific research cannot be questioned and has a significant impact on the integrity and outcomes. Responsible use is also a concern because some scholars use chatbot outputs with no acknowledgement of the source. They used AI chatbots to assist them in writing, developing their manuscript and generating responses to reviewers, but they provided this as their original work, which raises again concerns about accountability, responsibility and integrity. An academic commented that:

> Recently, I received a comment from a reviewer about my manuscript submitted to one of the international journals, Q2 Scopus and ISI indexed, by the way. I asked ChatGPT about this, and I have used the output in my response to the reviewer and in my revision. The paper is now published. To be honest, I do not understand this point to date [Res7].

The above researcher who published this paper confirmed that this paper was published at the beginning of 2023 before most international journals used software to check AI use in publication. However, some international journals do not check AI to date and do not have the proper software for checking the use of AI in their published work. In addition, the contemporary AI detectors are not 100 % accurate and efficient in detecting AI-generated contents. This requires adopting AI contemporary detectors alongside traditional anti-plagiarism tools for making sure that the published text is generated by humans not AI tools.

The fourth concern is associated with authorship, copyright, and licenses. More specifically, leaders of scientific research were concerned about who owns the copyright of the chatbots' output. It could be the system creator, users of the system, the chatbots themselves, or the main source from which the trained data came. Again, many academics argued that they are using chatbots throughout their research process but do not really mention or acknowledge them in their work. This is because they believe it is an assistance tool and could be used but cannot be referenced or mentioned in the publication. An academic commented:

> I use many AI chatbots in my research, such as ChatGPT and Bard, and I do not mind adding them as my coauthors or citing them in my article, but how can I do this? Policies of most publishers do not accept them. What shall I do? Do you think I should stop using them in my publication? [Res5].

In this case, the work was published as an original contribution by the authors, which again raises a major concern about research integrity. Regarding this point, one of the scientific research leaders commented:

> Any leader in higher education or research institutions has to be concerned about the use of chatbots in scientific research and publication. We do not really think that any AI tool could be an author or hold the copyright. It could be an assisting or supporting tool. We have developed this tool to help us, not to be the author… Where is the academic and research integrity? [Lead1].

The fifth concern was related to equality in chatbot accessibility and usage. Interviewees argued that ChatGPT-4 is a paid source and hence many researchers from developing countries are not able to access this tool. Instead, they use the free version with limited features. This could be seen in the following comment by one of the international researchers who works in Saudi Arabia:

> I can pay for any AI tool, but my colleagues in my home country could not really do this. They ask me to help them. I do this but they could not pay or have a communication with other scholars. Do you think this is fair or ethical? [Res11].

Another concern raised by interviewees is that some aged academics are not familiar with AI technology and found it difficult to use technology without assistance from other colleagues or a specialised unit at their institution, which does not exist in all institutions, where interviewees are currently working. The following comment by a young researcher explains this issue:

> Not all researchers found it easy to use AI chatbots. Some of them do not really know about this because they are not familiar with the technology in general and AI in particular. Many of my professors are not aware of this, to be honest [Res18].

This means that despite AI's potential to bridge the technology gap, it is now contributing to widening the gap between digital natives and non-digital natives and between those from developing and developed countries, who can easily pay and access all chatbots.

The sixth concern was associated with hallucinations of chatbots and its tendency to imitate humans resulting in fake and inaccurate references and increasing rate of unintended plagiarized work. Interviewees commented about this arguing that work generated by ChatGPT was neither noted by "Ithenticate" nor many of AI detectors as a plagiarized work, though it is used by most of international journals. This requires the use of both tools in order to ensure the originality of the submitted work. They have submitted it to one of the international Scopus-indexed journals and published it recently. Another interviewee commented that although their university has a subscription to Turnitin, they have to pay additional fees to check AI use in their publication. Nonetheless, institutions have to subscribe to AI-checking services by Turnitin to allow their researchers access to such services without additional payment. This again raises a burden on some young and public universities in developing countries, where they have limited financial resources.

> We work in a team, and some of us may use AI. Hence, we need to double-check before submission. We can pay for this service, but many other researchers in our home country could not do this. Again, do you think this is fair and ethical? [Res21].

The seventh concern was associated with the recency of the ChatGPT outputs, which is limited to 2021. Hence, concerns about the recency and accuracy of information remain under question. This requires the researcher to use other chatbots connected to the internet, such as Bing Chat and Bard (now Gemini), to double-check the updated information. This is connected with Concern Number Eight, relating to the validation of information given by chatbots for use in research and publication. There was a consensus among the researchers and leaders that the outputs of chatbots must be validated by researchers and experts in the discipline of research before publication. One of the leaders commented:

> Validation of outputs is the responsibility of our researchers. We should not trust the outputs of AI chatbots without double-checking and peer reviewing [Lead3].

The ninth concern for the use of chatbots is the negative effect on human interaction and interpersonal communication skills with other academics and scholars. Some of the interviewees argued that since they started to use AI chatbots extensively, they had to limit their work with other scholars and work alone with AI tools' support. There were comments by several academics that their extensive use of AI chatbots may have a negative impact on their mental health. This could be noticed from the following comment:

> I have extensively used technology, particularly AI chatbots, in my teaching and research. I prefer self-isolation and less contact with other researchers, but I started to feel headaches and I am tired most of the time. I guess it could be due to my huge use of technology [Res19].

The last concern is critical, as many interviewees argued that the responsible use of chatbots with limited peer review for validation has led to the emergence and spread of pseudoscience. Some interviewees shared their experiences in using Bard and ChatGPT to develop their research articles and argued that most of their articles were developed with assistance from chatbots, and they published several research papers with the assistance of this tool. However, scientific research leaders were concerned about the outputs of this tool and confirmed that caution should be taken when disseminating this information, especially in international publications. Among the comments of scientific research leaders:

> I am indeed worried that the irresponsible use of AI in research with no proper validation could spread junk science. Predatory journals would find room to publish such research to generate money from publication [Lead6].

> We need to be careful about ChatGPT and other similar tools in publication. We need to take our role in managing this usage seriously as it could lead to the presence of pseudoscience that includes some assertions that are not really true or scientific [Lead2].

Theme 2: Strategies for mitigating ethical concerns relating to chatbots

Interviewees agreed that the ethical concerns relating to chatbot usage in research and publication would be overcome if the proposed strategies for mitigating these concerns were adopted (see Table 2). There was consensus among concerned leaders and researchers that there is a quick need to develop a policy and guidelines on the responsible and ethical use of AI research and publication. The policy should maintain the privacy of users and protect their personal information. This policy should clearly explain the accountability and responsibility of each key stakeholder. Among the comments of both leaders and researchers:

> There is no doubt that we are in a need for a policy organising this AI use in education and research. Our policymakers should supplement it with guidelines that address all associated concerns [Res9].

> The increasing use of chatbots by researchers calls for rules that organise this usage in our institutions [Lead2].

The accountability and responsibility of creators ensures accurate and unbiased data when they develop the system. In addition, the responsible use of outputs by academics is important for a sustainable research process. It is the main responsibility of the academics/researchers to double-check the accuracy of the quality of outputs. Both leaders and researchers agreed that our academics or researchers must recognize the hallucination feature of chatbots and thus the outputs may not be accurate. Therefore, it is their

responsibility to validate the quality of outputs and double check the recency of the assumptions provided by chatbots. Additionally, the use of AI detectors alongside traditional anti-plagiarism programs are recommended to ensure the text is not AI-generated contents and human original work. Here are some examples of the interviewees' comments about this issue:

> I think it is our responsibility as scholars to ensure that the information gathered from whatever source is accurate and scientific. We have to check the validity of collected information as we always do [Res9].

> Our academics have to recognise the limitations of these AI tools and use them responsibly to advance their knowledge, not anything else [Res15].

Table 2. Strategies to deal with ethical concerns relating to chatbot usage in research and publication.

Concerns	Proposed strategies to mitigate concerns
1. Privacy and confidentiality	There should be a clear policy and guidelines for protection of users' information and maintaining their privacy and confidentiality with special consideration of AI tools. Personal data must not be used without the approval of the users.
2. Bias and inaccuracy	Academics and researchers should maintain awareness and undertake a critical review of chatbots' outputs to ensure their accuracy. Peer review remains the most valid approach to date for ensuring the quality and validity of the outputs.
3. Accountability and responsibility	Everyone from the key stakeholders (e.g. policy makers, creators and users or academics) should undertake their role responsibly and ethically. This should be part of the overall policy on IA incorporation in research.
4. Authorship and licensing	Policy makers and international research dissemination businesses have to establish a clear policy and guidelines on the AI outputs authorship, copyrights and licenses. The policy must addresses concerns relating to authorship, copyrights and licenses.
5. Fairness and data accessibility	Universities and research centers should facilitate responsible AI usage by bridging the digital divide and allowing up-to-date technology. A supporting AI unit could be established at each institution to assist academics in their work.
6. Hallucinations of chatbots	Recognizing the drawbacks of chatbots is important. Checking the validity of outputs is the responsibility of academics/ researchers. Acknowledgement of all sources, including chatbots, is important for ethical research.
7. Recency of information	Recognizing the limitations of the latest outputs by some chatbots is important for assigning the quality of outputs. Using various chatbots and databases is important to ensure the recency of information.
8. Validation of information	Peer validation and evaluation of the chatbots' outputs remain the key tools for assessing the quality of research and publication. Outputs should be reviewed by experts to ensure the quality of outputs. The use of AI detectors alongside traditional anti-plagiarism programs is recommended.
9. Absence of human skills	Quality of scientific research should balance the integration of AI in research and communication with other scholars for better and sustainable outcomes, especially in the long term.
10. Emergence of pseudoscience	Academic integrity and sustainability of scientific research are the responsibility of everyone from the key stakeholders (i.e. policymakers, university and scientific research leaders, AI system creators, and academics)

The policy should also ensure equality and fair accessibility to AI tools and chatbots that assist academics in their research. For example, the IT unit at each institution could provide support for academics about the effective use of AI chatbots in education and research. This includes providing training sessions, workshops and ongoing technical support. Many academics and their leaders, as can be seen from the following comments raised this point:

> I think there should be an AI-supporting unit in this digital era of learning. This unit gives the required technical support for academics and students. Training programs and workshops on the effective use of AI in research could also be provided [Res4].

> All Saudi institutions have an IT support unit, but I do not think that they provide support for AI use in education or research. Why not integrate AI into their current responsibilities [Lead2]?

Interviewees suggested that policymakers of higher education and international research publishing businesses must publish clear guidelines regarding the authorship, licenses and copyrights of the chatbots' outputs used in research and publication. All these suggested activities would certainly make the best use of such technology. It should support research integrity and limit the dissemination of pseudoscience as approved by interviewees.

Theme 3: Ethical decision to use or non-use chatbots in research and publication

Both academics and leaders of scientific research were asked about what shaped their ethical decision to use or not use chatbots in research and publication. Academics fully agreed about the use chatbots in their research. In their discussion about this point, they paid more attention to the benefits and opportunities that chatbots create for them as researchers, reviewers, and editors of research outputs. They focused on their comments on counting the advantages of chatbots, e.g. idea-generation for research, undertaking a literature review, translation, and proofreading service for non-native speakers, data analysis and final manuscript preparation for publication. They also commented on the chatbots in suggesting journals for submission and suggesting reviewers for the manuscript. Chatbots also supported them in their perpetration of responses to reviewers' comments. Academics argued that chatbots are a great supporting tool, which makes their research process easier. Chatbots also supported them in their review and editing of manuscript to make the right decision about the status of manuscript. This group of participants believe that chatbots provide more good than harm for their research and publication. This could be seen from the following comments:

> The benefits of using AI chatbots are countless and unlimited. They are fantastic tools that made our research journey easier. We can use them in every step, and they give us quick and prompt responses. I think they are advancing scientific research forward [Res3].

> Let's compare the advantages of ChatGPT with its disadvantages and find an answer to why we are using it. It made our research process simpler… I understand some people may talk about the inaccuracy of information, but we can validate this. Look at the numerous advantages, please [Res1].

Hence, this group of research participants focuses on the benefits or advantages to justify their use of AI in their research. They followed a utilitarian approach when making decisions about the use of chatbots in their research and publication, with little attention paid to the negative consequences.

The second group of participants, who are mainly leaders of scientific research, are concerned about the integration of chatbots in research and publication because their harm exceeds their benefits or good. This group of participants are concerned about academic integrity and the presence of fake and/or junk science because of chatbots' hallucinations as well as biased and inaccurate outputs, which could find room for publication in predatory journals or online without a proper peer review process. This group of participants were much concerned about the long-term impact of chatbots integration if they are used irresponsibly. Therefore, their decision was made based on virtue and common good approach that prioritise virtues such as integrity, equality, and accountability for the sustainability of research. This could be observed from the following comments:

> We need to look at the long-term impact. Yes, AI chatbots give some support to our students and academics in learning and research. However, limited attention to the limitations of these tools and irresponsible use of these answer generators could produce fake science [Lead10].

> I think caution should be taken when institutions decide to integrate such AI tools in learning or research. We have to look at both positive and negative impacts. I am not well-motivated to officially integrate them because I believe their negative impacts are undoubtedly higher than their positive impacts [Lead1].

Discussion

Since the launch of generative AI chatbots, they have gained high acceptance from users in many fields including healthcare (Wang et al., 2023), customer service (Huang et al., 2024), and education (Rudolph et al., 2023; Al Lily et al., 2023; Al-Abdullatif, 2023; Hasanien & Sobaih, 2023; Xames & Shefa, 2023). In the same context, previous studies (see, for example, Xames & Shefa, 2023; van Dis et al., 2023) showed that AI chatbots have a promising application in higher education, including research and publication. There are growing studies on the opportunities, benefits, and challenges of chatbot usage in research. However, there is a lack of studies on the ethical concerns relating to chatbot usage in the scientific research process. This study addressed this matter and explored the ethical concerns associated with chatbot usage and strategies for mitigating these concerns. The research explored how academics and scientific research leaders made their ethical decisions for the use or non-use of chatbots in their scientific research process.

This research showed that ethical concerns are not only associated with legal, technical, and informational concerns but also have social concerns and implications for the sustainability of scientific research. The results identified ten major concerns, including privacy, confidentiality and data protection, bias and inaccuracy, accountability and responsibility, authorship, copyright and licenses, fairness and data accessibility, hallucinations, recency of data and information, validation and assessment of information, human skills and interaction, and the presence of pseudoscience. Many of these concerns were also found in earlier studies on AI use in research and education (Chaka, 2023; Chaka, 2024; Popenici, 2023; van Dis et al., 2023; Xames & Shefa, 2023). However, the results of this research showed that these ten concerns were related to either legal, technical or social aspects. In addition, these concerns are interrelated and overlapped, albeit they all contribute to the presence of fake, junk and/or pseudoscience (see Figure 1).

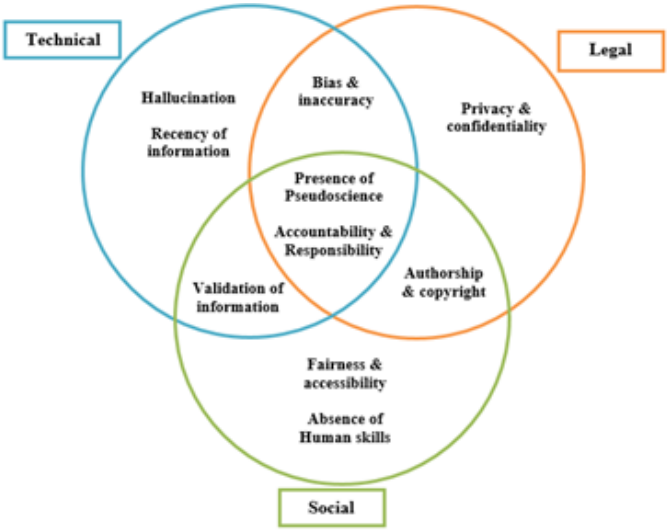

Figure 1. The overlap between ethical concerns associated with the use of chatbots.

Strategies for mitigating these concerns were suggested based on discussion with academics and scientific research leaders in Saudi Arabia, which is also of benefits to other countries. There was a consensus among all participants that a policy on the use of AI and AI chatbots in research should be developed as soon as possible to manage the irresponsible use of AI in research and publication. Aligning with previous research (Rudolph et al., 2023; Hasanien & Sobaih, 2023), this policy should manage the concerns related to privacy and data protection, authorship, copyright, and licenses. The policy should maintain the accountability and responsibilities of system creators and users. They should act ethically and responsibly in building the system, training data, and using the outputs. Academics have to be aware of chatbot limitations such as hallucination, data bias or inaccuracy, which require further validation and evaluation by them and experts in the field (Xames & Shefa, 2023). There is a need for accountability in developing the system and responsibility in using the outputs and considering the limitations of chatbots. It is important that academics adopt responsible use of AI chatbots and validate the outputs to prevent the presence of fake or junk science and ensure the sustainability of scientific research.

The ethical dilemma regarding the use of chatbots in research and publication arises when each group of participants (academics and leaders of scientific research) has its own justification and decisions about the use or non-use of chatbots in research. Most of the higher education institutions in Saudi Arabia force their academic staff, particularly international staff, to publish at least one international journal article annually. Hence, academics who did not have earlier experience in publication were looking

for assistance and found chatbots a great tool to facilitate this for them. The results confirmed that academics believe that chatbots have many advantages and few disadvantages. They were more interested in their advantages. However, leaders of scientific research believe it has a long-term impact and research integrity would be at risk. The first group considers the utilitarian ethical model that found the advantages of chatbot use in research and publication extremely exceed the disadvantages. This finding coincides with the utilitarianism approach, which was built on the theory of morality that supports activities, which foster positive outcomes and oppose those that generate harm or negative outcomes (Donagan, 1977). However, the second group members argued that these disadvantages put the integrity and sustainability of scientific research at risk. Hence, they believe in "virtue" or "common good" approaches to ensure positive long-term impact. Those who belong to virtue ethics are not concerned with codes of morality. However, they believe in the quality of consistently acting in harmony with their values (Crossan et al., 2013). In other words, those leaders are sacrificing morality for the "common good". Therefore, they were cautious about the use of AI chatbots without a clear policy. Hence, the policy of AI use in research and publication is urgently needed to address these concerns and make the best use of technology and AI in research and publication.

Conclusion and future research directions

This research provides an insight on the ethical concerns and ethical dilemma relating to chatbot usage in research and publication. The research showed ten ethical concerns connected with legal, technical, and social concerns (Figure 1). The research showed that the ethical concerns are overlapped and are connected to irresponsible use of chatbots and their generated contents, which has an impact on the spread of pseudoscience. The research provided strategies for mitigating the risk associated with these concerns. The dilemma for the use or non-use of chatbots was related to how to view and use the chatbots. When academics found the chatbots' benefits overcame their challenges, they intended to use them intensively, employing a utilitarian approach. However, others believe that the disadvantages would have negative consequences, especially in the long term. They do not encourage their usage and believe in a "virtue" or a "common good" approach.

This research draws on a qualitative study with a sample of participants from public universities in Saudi Arabia who came from different backgrounds and cultures; this research did not analyze the participants' backgrounds or cultures and link them with their opinions. Further research could undertake a quantitative approach with a more significant sample to examine the variables that affect their ethical decision to use various chatbots in research and publication. A comparative study of the researchers' perceptions from various countries would be another avenue for future research.

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