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Integrating technology in social science research: emerging trends and ethical considerations

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***Abstract*—The paper is a result of a complementary advanced publication workshop accompanying the curriculum course exercises for PhD students, on the role of ICT in the research work of a scientist. This article examines the impact of digital technologies on social research, focusing on social media, open science, and generative artificial intelligence (GenAI). It discusses the benefits and challenges of recruiting research participants through social media, open science practices, and the application of GenAI in academic research. It also presents ethical and methodological aspects of these technologies, emphasizing the need to update ethical guidelines. The article concludes with recommendations for the integration of digital technologies in research, with an emphasis on developing technological competences and maintaining scientific standards.**

***Keywords*—ICT; social media; open science; generative AI; digital competencies**

INTRODUCTION

THE development of digital technologies has significantly influenced research practices in social sciences and humanities, providing new tools that support both research and analytical processes.

This article explores three main areas of digital technology application: social media as a tool for recruiting research participants, open science practices, and the growing role of generative artificial intelligence (GenAI) in academic research. Each of these areas presents unique opportunities and challenges that are reshaping the landscape of social science research.

The first chapter delves into the use of social media for recruiting participants from hard-to-reach groups, such as transgender and non-binary individuals. It discusses the advantages of broader access to diverse populations, alongside challenges related to ethics, methodology, and potential risks. Social media platforms, with their vast reach and user engagement, offer unprecedented opportunities for researchers to connect with marginalized communities. However, this approach also raises significant ethical concerns, including issues of privacy, consent, and data security.

The second chapter focuses on open science practices, such as open access to data and scientific publications, and their importance for increasing transparency, fostering collaboration, and enhancing the visibility of research. Open science aims to democratize access to scientific knowledge, making it freely available to the public and other researchers.

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This chapter examines the benefits of open science, including improved research reproducibility and increased public trust in science, as well as the challenges, such as data protection and inequalities in resource access.

The third chapter examines the growing role of generative artificial intelligence (GenAI) in academic research, analyzing its potential applications in designing experiments, data analysis, and academic writing. GenAI tools, such as ChatGPT, have the potential to revolutionize the way research is conducted by automating complex tasks and providing new insights through advanced data analysis. However, the use of GenAI also brings ethical considerations and technical limitations that must be addressed to ensure responsible and effective use of these technologies in research.

I. SOCIAL MEDIA AS A RECRUITMENT TOOL FOR HARD-TO-REACH AND MARGINALIZED POPULATIONS ON THE EXAMPLE OF TRANSGENDER AND NON-BINARY COMMUNITIES

Along with the ongoing digital revolution and the ever-improving access to the Internet, social media (SM) is playing an increasingly important role in society, facilitating communication [e.g. [1, 2, 3, 4, 5, 6, 7, 8]]. This phenomenon is also being used by researchers, who, thanks to SM, can get access to hard-to-reach, stigmatized and marginalized populations [9, 8]. SMs are used in the research process, among other things, as a source of data, a subject of research, or a recruitment tool for research participants (RP) [7, 8]. The article addresses the benefits and risks of this method of RP recruitment from hard-to-reach populations, as well as potential future perspectives and new opportunities. The purpose is to highlight aspects relevant to doctoral students and young researchers in the social sciences, which are less often highlighted in the literature and require in-depth discourse. The article reports on the case study employing SM recruitment method that was conducted among transgender and non-binary people for a master's thesis. Future directions of SM development in terms of their application in recruiting RPs from marginalized communities were proposed, as well as potential new risks.

SMs differ in their environments and in the way, users use them to communicate with each other [10]. The most popular are Facebook (more than 3 billion monthly active users), Instagram (more than 2 billion monthly active users), WhatsApp (roughly 2 billion monthly active users), TikTok (more than 1.5 billion monthly active users), Facebook Messenger and X, and these are the most commonly used for RP recruitment [11], which type is selected according to the characteristics of the platform and the specifics of the group. In the case of Facebook, researchers can reach RPs through targeted ads, distribution of survey links on groups (open or closed), communities and

groups dedicated to completing surveys, as well as direct messages. [3, 12, 5, 8]. Researchers often combine different SM platforms to increase the reach and effectiveness of recruitment [5, 7, 8].

Limited research budget and funding problems are some of the main concerns that PhD students face [13, 14, 15]. SM makes it possible to conduct research at a lower cost than using traditional methods. This depends on the method of recruitment (including whether and in what form paid ads will be used) and the type of research being conducted: qualitative studies typically need a smaller sample than quantitative studies, and longitudinal studies often need additional motivation and gratification for OBs who choose to participate in subsequent stages of the study [16, 17] An important benefit from the doctoral student's point of view is the relatively significant saving of time in collecting the research sample. SMs offer easier access to hard-to-reach populations and allow for real-time analysis of the collected data, and based on this, help make further adjustments for further sampling strategies [3, 5, 7]. This form of recruitment is also subject to methodological and ethical limitations and risks. It is difficult to gather a representative sample, especially among the elderly and digitally excluded people. People without an account on a particular platform will not be able to take part in the survey, which may in turn limit the pool of potential participants [5, 7]. The quality of the data collected may be questionable by the lack of control over the process [5, 7]. From an ethical perspective, there are challenges in ensuring data confidentiality, informed consent for participation in the study, and with data protection [7]. The widespread access to SM, especially among adolescents, also increases the danger of their unintentional participation in research not addressed to them [4]. Moreover, online surveys, including those where RPs are recruited via SM, can be susceptible to infiltration by bots and scammers who can compromise data integrity [18]. This is important in surveys offering compensation for participation, where individuals may provide false data to meet the recruitment criteria [18, 19]. To minimize the risks associated with the challenges identified, researchers should take a tiered approach to fraud prevention, by, for example, implementing various security measures, such as careful design of recruitment materials, protocols for verifying participant eligibility, and data verification methods [18]. The success of online recruitment depends on many factors, such as the type of study, the characteristics of the targeted population, and the project budget. It is important for researchers to be aware of potential challenges and use appropriate strategies to prevent them.

A. Case studies

SM's global reach makes it possible to reach a large number of people, including those who, because of their location, lack of time, or other reasons, such as fear of revealing their identity, might be excluded from studies conducted in the traditional form, as well as marginalized and excluded populations [2, 3, 4, 12, 5, 6, 8].

An example of a successful recruitment of RPs from a marginalized population is the research on the psychosocial correlates of minority stress experience in binary transgender and non-binary adults [20]. The study was quantitative and longitudinal, consisting of two measurements. One of the hypotheses suggested the relevance of participation in online communities and support groups was a protective factor for the mental health of these populations, so recruitment for the study took place exclusively in closed groups on the Facebook platform. The link to the survey form that had been made in Microsoft Forms was shared on the aforementioned groups as part of a post. The description provided the purpose of the study, contact information, and information that a similar post was also posted on other similar groups, in case there were any OBs who simultaneously belonged to several similar groups and thus avoided collecting data from the same person several times. The post included a colorful graphic with the purpose of drawing attention and encouraging people to participate in the study. The questionnaire included information about the longitudinal nature of the study and information about places where transgender people could find psychological support. The first measurement included 240 participants, of whom 191 (79.6%) were of the female sex assigned at birth and 49 (20.4%) were of the male sex assigned at birth. In the second measurement, there were 121 participants, and the distribution of sex assigned at birth looked similar (there were 98 people with female sex assigned at birth, and 23 with male sex assigned at birth). This is a relatively large sample for this minority group [21]. No financial compensation was offered for participation in the study.

Members of Facebook groups where recruitment was conducted could only be transgender/ gender non-conforming people. The fact that the researcher belonged to the researched group may have increased the motivation of other transgender and non-binary people to take part in the study. What could have had a role here is the mechanism of the dynamics of in-group behavior, which is the Social Identity Theory (SIT; [22, 23, 24] as well as community connectedness [25]. This shared identity could foster a sense of belongingness and solidarity [24, 26]. The SIT theory assumes that when a person identifies with a group, they are more likely to engage in behaviors that will benefit them [24]. In the case of the conducted study, this could provide an opportunity to learn about its results and practical implications, which could be important for better understanding of community needs and developing new opportunities for support.

Researchers could use this phenomenon during recruitment as a potential method to increase motivation among RPs. This could help to reduce the cost of this part of the project, making it easier to conduct research. A researcher analyzing his own community as an *insider* should be mindful of the dangers of bias as well as abusement of the group's trust [27]. The researcher's ability to be reflexive, or the ability to consciously address one's own experiences and biases, is crucial here [27].

It is worth considering hiring so-called influencers trusted by the community to promote and encourage participation in surveys, which is already started being utilized and implemented [28]. The aforementioned community connectedness and the influence of influencers can also be used as elements of one method of RP’s recruitment, which is the digital version of Respondent Driven Sampling (RDS), or WebRDS. The traditional RDS has already repeatedly demonstrated its usefulness in recruiting RPs from marginalized and stigmatized communities [29], WebRDS, by taking advantage of the potential lying in the Internet's communication capabilities, has proven to be even more effective. Previous research on the effectiveness of WebRDS has shown that this

form performs better than traditional RDS in terms of speed of the recruitment and its costs [30, 31], which is important for doctoral students often working under time and budget constraints. Influencers, by having relevant outreach and trust from the community, could significantly increase the reach of WebRDS and accelerate recruitment. Their recommendations could encourage followers to participate in the survey, especially if the influencer has an authority in the group.

When drawing and generalizing conclusions, it should be taken into consideration that the presented study had a specific type of sampling.

It is also worth mentioning that online sampling methods are not only implemented by independent researchers, but also in wider projects, for example the LGBielefeld 2021 – a cross-sectional survey on the living conditions and daily experiences of LGBTQ people in Germany [32].The main recruitment strategy was based on paid Facebook ads. Unpaid online recruitment strategies were also used, such as posting on Instagram, TikTok and Reddit, sharing the survey link in Facebook groups like in the aforementioned study on transgender and non-binary people [20] and Reddit, publishing invitation posts on profiles on Instagram and TikTok, and sharing the survey link in the Telegram group and the LGBTQ Research Network. Analysis of the effectiveness of applied recruitment strategies has shown that Facebook ads were the most successful strategy (29,216 unique link clicks). Unpaid strategies proved much less effective (199 completed and eligible surveys); however, it should be noted that the strategy of providing an invitation link at the end of the survey to forward the invitation to other LGBTQ group members proved to be the most effective of the unpaid sampling methods (85 completed and eligible surveys). This could be another indicator of the effectiveness of community connectedness and importance of trust within the researched population.

It should be noted that both presented studies were carried out in the western, European cultural framework. When conducting cross-cultural studies, researchers should be mindful of the differences that may arise in terms of SM use. As the research shows [33], it is up to certain cultural dimensions [34]: individualism/collectivism and uncertainty avoidance that users may engage differently in SM. In cultures characterized by high levels of uncertainty avoidance, both privacy concerns and a perceived sense of having control over it strongly influence the expression of opinions. This means that people from such cultures are more sensitive to the risks associated with sharing information and are more willing to engage when they feel they have control over their data. Collectivism, on the other hand, significantly affected the relationship between social capital and the relationship between a person's social media evaluation and the expression of opinions. With high collectivism, social capital had a stronger influence on online expression, while in low collectivism, social media evaluation had a stronger influence. It also appears that national culture can influence how individuals perceive and disclose more sensitive and personal topics, for example, their mental health problems [35]. Cultural norms can influence what emotions are acceptable to express in public, as well as the level of openness when discussing mental health issues.

There are also other contextual factors that can affect online engagement, such as the economic or political context. For instance, in China [36] , there is a high level of social media censorship, which can influence what content is being displayed and therefore limit the ability to reach RP.

B. Future directions

Emerging new digital trends and solutions could have applications in research, including the recruitment and collection of the research sample, by neutralizing risks and addressing limitations. The potential offered by artificial intelligence (AI) and new SM developments, including the ways in which users interact with each other, is unmissable. One trend that is worth keeping track of is the development of decentralized social media as an alternative to traditional, centralized platforms such as Facebook, X, or Instagram, from which they differ by not using a single, central entity to exchange information but rather handling it through a network of independent entities, using technologies such as blockchain [37, 38, 39, 40]. Decentralized SM platforms facilitate direct interactions between users, reducing the dependency on intermediaries. This model of governance also makes decentralized SMs more resistant to censorship, which can be especially important in places where freedom of speech may be restricted [40]. In the context of research, this may also enable obtaining more authentic answers. In addition, many decentralized platforms use tokenization to reward users for their involvement, such as in content creation or moderation [41, 42]. This could encourage more active participation and solidify the community, which, combined with community connectedness, could offer potential for RP recruitment. Additionally, tokenization opens new possibilities in rewarding RPs for study participation. It remains to be seen how the development of these platforms may affect research and recruitment in practice. However, it is possible that the potential offered by decentralized SMs in terms of securing users' privacy and protecting their identities may attract people from marginalized communities to use them [43].

Ethical guidelines need to be updated to be relevant to the changing situation and adequately address AI issues such as data privacy and confidentiality, the impact of AI on RPs and their informed consent, i.e. whether research participants fully understand the implications of AI use and give informed consent to participate in the study. [44]. RP’s personal data protection is crucial, especially for stigmatized and marginalized populations [3, 4, 5, 6], as many of them out of fear of unintentional ”outing”, that is the revealment of their identity may be hesitant to participate in the study [45]

Moreover, the researchers should always have in mind, that in their work they are still dealing with real human subjects, even when there is no physical contact. They should avoid a situation where RP are in their minds reduced to mere numbers and raw data [46]. And it is because of this lack of direct contact that it is the responsibility of the researcher in particular to provide clear and understandable information about the study objectives, how the data will be used and potential risks. Absence of immediate contact also requires the researcher to the safety issues of the conducted study. This includes potential risks to RPs such as exposure to triggering content that may exacerbate or worsen one’s condition or experienced trauma. Therefore, in addition to informed consent, we as researchers must ensure that RPs are not to be left alone in such situations.

One of the prevention methods for such instances is to post contact information for places where RPs can get help. Participants should also be provided with the opportunity to directly contact the researcher, for example via email, phone or chat [18].

Undoubtedly, the development of SM has given researchers new opportunities for conducting research and reaching out to diverse populations. For doctoral students and those at the beginning of their research careers, this opens new perspectives but also brings new challenges and risks. Research involving SM requires careful planning, consideration of ethical and methodological challenges, as well as the need for proper strategic and precautionary measures. It is important to stay up to date with technological developments and adapt one's research methods to the constantly changing reality. In the end, SM are just another research tool, and as with all other tools, whether they are used responsibly and safely depends on the person using the tool—his or her knowledge and skills.

II. Open science practices in doctoral student work: benefits, barriers and recommendations

Open science is a range of practices, aimed at making the information about the effects and process of conducting research accessible to the scientific community and the wider audience. Besançon et al. [47] mention open access (open, free-of-charge access to articles after they have been published or before, as a preliminary, unreviewed version of the article – a preprint), open source, open data (publishing databases, source codes, research procedures or questionnaires) and open peer review (making reviewers' reports available) as open science practice categories.

Currently, one can observe a peculiar shift towards open science and its dynamic development - a study by Ferguson et al. [48] shows that researchers' declared use of its practices has increased from 49% in 2010 to as much as 89% in 2023. The COVID-19 pandemic proved to be a watershed period, emphasizing the power and opportunities behind open science for the public. As Besançon et al. [47] note, a widespread commitment to accessibility was observed from both researchers and journals. Large publishers, such as Springer Nature and Elsevier, published new articles related to the pandemic in open access. Authors made preprints available on external sites in an organized manner, allowing other researchers to review the results quickly. Reviews were also published on external portals. This allowed unprecedented rapid development of COVID-19 vaccines [49].

With the widespread acceptance of open science and the awareness of its success during the pandemic, practicing it may seem like a natural choice. The right of the public, which funds the development of science through state institutions, to have unrestricted, free access to its results can be considered undeniable [50]. However, open science comes with both several advantages and some challenges, which this paper will describe from the perspective of PhD students and other early-career researchers.

The main, and most widely cited, advantage of using open science practices is increased transparency in communicating the results of the conducted research, translating into increased credibility and expanded opportunities for them to be reviewed and evaluated by other researchers [51, 52]. It seems particularly important in times of the replication crisis [53] and in connection to the practices of unreliable reporting research results being noted [67]. Pre-registration of research projects and sharing of databases or additional information on procedures and tools allows the scientific community to control the validity of the research process and enables more accurate replication of studies [51].

In addition to issues of research reliability and credibility, open science is also intended to lead to the expansion of cooperation among researchers instead of promoting competition between research institutions and their representatives [53]. The underlying idea is for the international scientific community to strive together to expand the state of knowledge, more than to promote the prestige of an individual. Collaboration is a particularly important value for scientists in the early stages of their careers. Practicing open science allows them to expand the reach of their work, and thus its relevance and recognition in the scientific community [52, 54]. It allows them to network, which proves to be an immensely valuable thing in the career development of a young researcher. The proficiency of young scientists in the use of technology, which is often higher than that of more experienced individuals, can prove to be a significant advantage, allowing them to make greater use of websites and other media that facilitate the practice of open science [54].

Using open science from the audience perspective, by analysing source codes, research procedures and reviewing databases, as well as reading published article reviews, can provide a valuable opportunity for doctoral students to train and expand their competence. With the opportunity to learn the details behind the publication in their area of interest, they have an opportunity to learn the techniques and best practices used. Additionally, by reading the reviewers' comments, young scientists gain knowledge of the expectations set by experts in the field [47].

In addition to the undoubted advantages of open science, some associated barriers and risks can also be identified. These include the concern that preprints, made available to the general public before the peer-review process, will be of unsatisfactory quality and with premature or illegitimate conclusions. Readers, especially those not directly related to science, may then unwittingly use unverified sources, spreading distorted or false information [47]. On the other hand, the author of incomplete or under-reported preliminary results risks criticism from the scientific community. This is a concern for young researchers, who list it among the barriers that keep them from adopting open science practices [54]. Indeed, some scientists perceive that openly sharing their results often leads to harsh criticism, based not only on the actual quality of the reported research but also acting as a manifestation of discrimination among certain groups, such as feminist psychologists [55]. Thus, open science practices can raise fears of increasing divisions and discrimination. Also worth noting in this context is the topic of the financial outlays that open-access publishing entails. Due to the unequal access to economic resources, often needed to publish in open access, and to the tools that allow them to make their work available, the asymmetry in favour of scientists in an already privileged position is deepening, especially in terms of the number of citations acquired [55, 56, 57]. However, it is worth keeping in mind free platforms that are popular among researchers, while being available to early-stage career

researchers - such as ResearchGate, or the Open Science Framework. Focusing on these types of opportunities may allow the power disparity to be offset to some extent.

TABLE I
ADVANTAGES AND DISADVANTAGES OF OPEN SCIENCE PRACTICES

Advantages	Disadvantages
Increased transparency in communicating the research	The risk of unreliable research being shared online and cited
Expanded opportunities for research to be reviewed and evaluated by other experts in the field	Opportunities for harsh, or even off-topic criticism
Encouraging cooperation between researchers	The risk of de-anonymization of the databases shared online
A valuable material for learning and gaining competence	Respondent's concern of data privacy
	High fees for open-source publishing
	The need for financial outlays, which increases the advantage of wealthier individuals and institutions

An ethical aspect in the context of open science is the privacy of data, shared as a part of research databases. This is particularly important for research conducted on vulnerable groups [58] and projects that involve the collection of medical data [47]. Data anonymization, in the face of currently available technologies that enable efficient re-identification, is often insufficient. The case study by Sweeney et al. shows, that de-anonymization of data from shared databases is possible even when the provider makes an effort toward privacy [59]. Data anonymity is an aspect that is also important to respondents themselves. A study by Liu and Wei [60] indicated that when participants know of the intention to make a database freely available, they are more likely to express concern about the security of the information they provide. This also has a significant impact on the sincerity and completeness of their answers.

Another important question are the regulations imposed by journals related to the release of information about the research published on their pages. While the publication of supplementary material is generally not associated with any restrictions, the entire text is usually subject to regulation. Most publishers, such as Elsevier [61], Taylor & Francis [62] or American Psychological Association [63], allow full publications to be shared with personally known researchers and with students, as part of the author's ongoing teaching. In the form of preprints, articles can be published at the will of the author [61] or only in specific places, such as relevant repositories [64]. The release of the final text after the review is generally possible only after an embargo period, determined individually for each journal, but usually amounting to at least a year [61, 62]. This means that an article that has not been paid for as an open-access publication can be made available to the general public when it has already lost its relevance and timeliness. The author must therefore rely on the motivation of readers who will gain access on their own or take advantage of the opportunities of the represented institution.

As UNESCO [65] notes in their publication on recommendations on open science, greater openness of information means greater accountability. There are several benefits to following the practices described, including not only fostering the quality of science but also opportunities for career development and relevance of one's work, especially from the perspective of doctoral students as early-career researchers. On the other hand, open science does not exist without costs. An important issue is the conscious decision to follow its practices, as well as care for the quality of the materials made available and the privacy of the subjects.

III. THE USE OF GENAI IN SOCIAL SCIENCE RESEARCH: FROM DOCTORAL STUDIES TO ACADEMIC PRACTICE

Generative AI (GenAI) has introduced significant changes to higher education and research, particularly following ChatGPT's release in November 2022. Large Foundation Models (LFMs), including OpenAI's recent "o1 model", demonstrate capabilities comparable to "PhD students on challenging benchmark tasks in physics, chemistry, and biology" [66]. Initial responses to GenAI in academic settings reflected concerns about academic integrity. Some academics detected up to one-fifth of students using AI programs in assessments within two months of release, leading some educational institutions to label these tools as a "plague on education" [67]. Educational institutions have since recognized that preventing GenAI use presents significant challenges, particularly given the limitations of AI detection systems, such as low rate of accuracy [68]. This understanding has led to a different approach, with institutions now viewing GenAI as a resource for academic work, emphasizing the development of ethical guidelines, integration of AI literacy into academic programs, and creation of methodological frameworks that maintain scholarly standards while acknowledging technological advancements.

Large Foundation Models (LFMs) represent the core technology behind GenAI systems, operating through advanced language processing and content generation mechanisms. These models operate through specific learning techniques, such as Masked Language Modelling (MLM) and Next Sentence Prediction (NSP) [69]. These learning techniques allow processing of extensive datasets to generate contextually appropriate outputs. In terms of output generation, these systems can produce text resembling human writing suitable for articles, reports, and creative writing. A distinctive feature of contemporary GenAI systems is their multimodal processing capability, allowing them to generate diverse content formats including text, images, audio, and video. For example, text prompts can be translated into visual content through AI image synthesis capabilities.

These technical capabilities translate into practical research applications. ChatGPT and similar systems, built on LFM architecture, support multiple research phases through their processing abilities - from initial design to final writing. Research begins with question formulation and hypothesis development, where GenAI can provide structured assistance [70]. These tools can aid in methodological development through creation of research instruments, experimental stimuli, and structuring interviews [71], while supporting data collection planning [72]. In data analysis, GenAI offers statistical and computer programming support, in addition to processing and analyzing datasets. For qualitative research, these tools can

assist with coding processes and categorization [73], though requiring careful oversight. Specialized academic writing tools like Scite, ChatDOC, and Jenni.AI can be useful in paraphrasing text and improving writing clarity [74].

In social science research specifically, GenAI's role is still in its formative stages and scholars are exploring methods to integrate it into their work. Salah et al. (2023) recognized three potential applications: social interaction modeling through simulated dialogues, large-scale textual data analysis, and examination of cognitive processes in social behavior [75]. Building on these possibilities, Haluza and Jungwirth (2023) investigated GenAI applications in societal research through structured interactions with GPT-3's text-davinci-003 model [76]. Their method involved: (1) asking GPT-3 to identify and analyze ten societal megatrends, (2) applying varying text generation parameters (standard settings for first five trends, modified settings with 0.5 frequency/presence penalties for remaining five), (3) validating outputs through PlagScan and GPTZero, and (4) evaluating AI-generated citations. Their process revealed both capabilities and limitations of GenAI in academic research, with key findings on citation reliability (only 1 in 10 citations valid) and the importance of precise prompting for meaningful outputs. Beyond these challenges, ChatGPT's limited ability to interpret social context nuances [77] may affect research validity. Moreover, the emphasis on data processing might overshadow theoretical development, raising concerns about the depth of social science research [75].

These concerns reflect broader technical limitations in GenAI systems. Inherent biases in training data [78] affect content generation across languages and cultural contexts - for example, when asked for images of people in important jobs, systems predominantly depict white men [79] or react differently when prompted to answer from (fe)male or neutral perspectives in different languages [80]. Result validation presents additional challenges due to AI systems' opacity, making it difficult to trace conclusion pathways and identify errors [81]. Data quality can significantly affect output reliability; incomplete or outdated training data may lead to incorrect conclusions [82]. Perhaps most concerning for research applications, the "hallucination" phenomenon [83] means these systems can generate persuasive but entirely fictitious content, including false references and research findings.

Beyond these technical constraints, fundamental questions arise about academic practice and ethics. Educational implications include concerns about the value of academic qualifications, as GenAI might affect traditional markers of scholarly expertise [84]. Ethical considerations extend to data privacy and the protection of sensitive research information, requiring careful protocols for AI implementation in academic contexts in compliance with regulations like GDPR (General Data Protection Regulation).

The implementation of GenAI in research requires researchers to develop specific competencies. These include systematic validation of AI-generated content, careful verification of sources and citations, and critical evaluation of outputs [85]. Current algorithms can search and summarize but lack the ability to independently synthesize scientific text or arguments [74]. The systems' limitations in contextual understanding and disciplinary intuition emphasize the essential role of human researchers [74], who can create conceptual connections, and critically interpret findings within broader theoretical frameworks. This distinction reinforces the importance of developing researchers' literacy in both using AI tools and maintaining traditional research skills.

In conclusion, while GenAI offers significant research support capabilities, its current role remains complementary to human expertise rather than replacing it. The integration of these systems into academic research requires careful considerations of both theoretical and practical aspects. The implementation demands a structured framework for human-machine collaboration in research processes. This framework should incorporate multiple elements: addressing data biases, maintaining quality standards, ensuring algorithmic transparency, and considering ethical implications [74]. Theoretical foundations could also explain interaction patterns between human researchers and AI systems, specify appropriate conditions of use, and define methods for evaluating outcomes. Such theoretical grounding becomes particularly important as the complexity of AI in research continues to increase.

Implementation challenges extend beyond theoretical considerations to practical constraints. Academic institutions face accessibility challenges in developing and maintaining technological infrastructure to keep pace with rapid advancements in GenAI. Financial limitations strain budgets for immediate resources like hardware, software, and maintenance, while the fast pace of GenAI development complicates long-term strategic planning. Academia may struggle to stay current with new versions of GenAI products, and the lack of a common framework to measure their impact further complicates planning. These challenges necessitate coordinated approaches among academic stakeholders to develop sustainable implementation strategies that address technical, financial, and methodological considerations, such as investing in flexible infrastructures, exploring alternative funding sources, and developing a framework to assess the impact of GenAI technologies in research and education.

CONCLUSION

Digital technologies are reshaping the scientific landscape by providing researchers with new tools to support participant recruitment, data analysis, knowledge management, and scientific publishing. This study highlights the wide range of opportunities and challenges associated with their application, particularly in the context of social sciences. The integration of digital technologies into research practices offers significant benefits, including increased efficiency, broader access to diverse populations, and enhanced transparency and collaboration. However, these benefits come with challenges that must be carefully managed to ensure ethical and effective use of technology in research.

The use of social media as a recruitment tool enables researchers to reach hard-to-reach populations more easily, but it also requires careful attention to ethical considerations, such as ensuring informed consent and protecting participants' privacy. Open science practices enhance transparency and collaboration in research, but they also necessitate addressing issues related to data protection and inequalities in resource access. Generative artificial intelligence opens new possibilities for research, but it requires strict oversight to avoid methodological errors and ethical breaches.

In conclusion, while digital technologies present numerous opportunities for advancing social science research, their effective integration requires the development of technological competencies and the maintenance of high ethical standards. Researchers must stay informed about technological advancements and adapt their methods accordingly, while also being mindful of the potential risks and ethical implications of using these tools. By doing so, they can harness the full potential of digital technologies to enhance the quality and impact of their research.

The recommendations are as follows. Social media as a recruitment tool offer a cost-effective and efficient way to recruit participants from hard-to-reach populations. Researchers should develop strategies to ensure ethical recruitment practices, including obtaining informed consent, protecting participants' privacy, and addressing potential biases in the recruitment process. Open science practices such as open access to data and publications, promote transparency and collaboration in research. Researchers should advocate for policies that support open science and work to address barriers to access, such as funding for open access publishing and ensuring data protection. Generative artificial intelligence in research can enhance data analysis and academic writing, but it requires careful oversight to avoid errors and ethical issues. Researchers should develop guidelines for the responsible use of GenAI, including validating AI-generated content and ensuring transparency in the research process. Researchers should invest in developing their technological skills to effectively integrate digital tools into their research practices. This includes staying informed about new technologies, participating in training programs, and collaborating with experts in digital technologies. Maintaining high ethical standards is crucial when using digital technologies in research. Researchers should adhere to ethical guidelines, such as ensuring informed consent, protecting participants' privacy, and being transparent about the use of digital tools in their research.

By addressing these recommendations, researchers can effectively leverage digital technologies to enhance the quality and impact of their research while maintaining ethical standards and protecting the rights of research participants. Digital technologies, though not without challenges, serve as invaluable tools for researchers in a rapidly evolving scientific environment. Their effective integration requires the development of technological competencies [86, 87, 88, 89] while maintaining scientific integrity and ethical standards.

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