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The Impact of Digital Tools on Modern Research Practices: The Role of Institutional Review Boards (IRBs) in Research Ethics

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Abstract

In the 21st century, the development of digital tool technologies has led to a notable improvement in social science research worldwide. Thanks to these technological advancements, researchers can now easily access and analyse information, manage their time, and create more engaging research. This has completely changed the way that research is conducted. Review of the many studies on the influence of digital technologies on contemporary research methods is provided in this article. It concluded that digital tools, including AI and big data analytics, are transforming modern research practices by enhancing efficiency, data quality, and collaborative capabilities across healthcare, education, and social research. Institutions play a crucial role by investing in infrastructure, training, and ethical frameworks to ensure responsible and effective technology integration. While these tools offer significant advantages, challenges such as data privacy, ethical concerns, and the digital divide must be addressed. By fostering digital literacy, expanding access, and implementing clear guidelines, institutions can harness the full potential of digital tools to advance research practices in an ethical and inclusive manner.

Keywords: Digital tool technologies, Modern research practices, Data analysis, Data collection, Social research, Data privacy, Ethical concerns, Research methods, etc.

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1 Introduction

Recent years have seen revolutionary developments brought about by the use of contemporary technology into social research methodologies, particularly in educational settings. In particular, the methods used for data gathering, processing, and interpretation have changed as a result of digital tools and platforms. Digital sociology, for example, has developed as a discipline to comprehend these shifts, particularly in the educational sector [1]. Digital technology has an impact on social functioning and human behaviour, posing new problems for social research as well as methodological advancements. Specifically, digital technologies like social media, big data analytics, and online surveys are playing a bigger role in educational research because they provide previously inaccessible information [2]. Social media platforms have developed into abundant data sources that enable academics to examine interactions, behaviours, and trends in real time. Additionally, sophisticated analytics methods like machine learning and natural language processing improve researchers' comprehension of social data, including sentiment analysis and user behaviour [3]. Online surveys, despite its inherent biases, have also gained popularity as practical and affordable means of gathering data from a variety of demographics. Our comprehension of behaviours and consequences in social and educational settings is improved by the use of data in the form of conducting the process of merging survey and social media data, such as connecting Twitter data with mental health surveys [4].

Digital technologies have complicated ethical ramifications for social research. Concerns about privacy, particularly with regard to educational data, have drawn particular attention as academics struggle with the moral need to protect student and teacher data [5]. Similar ethical issues are brought about by techno-social developments in the healthcare industry, such as the escalation of the digital gap and worries about data justice and equality. Ethical factors including openness, permission, and fairness must be balanced with the advantages of data-driven insights in education in order to ensure ethical and equitable research processes [6].

A. The evolution of digital tools in social research

When statistical software such as SPSS was introduced in the middle of the 20th century, it completely changed how researchers handled big datasets and carried out intricate analyses. This marked the beginning of the development of digital tools in social research. As increasingly complex software, like R and Python, was developed over time, researchers' skills improved even more, enabling more in-depth data analysis and visualization [7]. These instruments signalled a dramatic change from manual data processing to more automated and effective techniques, setting the groundwork for the incorporation of digital technology into all phases of the research process [8], [9]. Applications of digital technology in social research have evolved along with it. The field of data gathering saw a significant transformation with the introduction of online survey tools such as Qualtrics, SurveyMonkey, and Google Forms in the late 20th century. These platforms greatly decreased the time and expense involved with conventional survey methodologies by enabling researchers to swiftly and effectively contact larger and more varied audiences [10].

B. Impact of digital tools on social research

In social science research, digital technologies have had a significant influence on data gathering techniques. Researchers no longer have to worry about their location or lack of resources to gather data thanks to online survey platforms like Qualtrics, Google Forms, and Survey Monkey. Particularly Qualtrics has become well-known because of its complex features, which enable more intricate and customised survey designs, such as randomisation, embedded data, and logic branching [11]. In addition to making the data collecting procedure more efficient, these technologies have raised the calibre and dependability of the data that was gathered. The development of online communities for collaborative research purposes has been made possible by new technologies, which have improved community and collaboration. This is especially true when the tools are used to share research materials and information, such as Twitter and social bookmarking [10], [12].

Some of the issues with conventional data gathering techniques have been resolved thanks to the use of mobile-based data collection tools like ODK (Open Data Kit), especially in rural and isolated locations. Researchers doing fieldwork in places with poor internet access have found ODK to be a useful tool because to its offline functionality and form design flexibility [13]. More thorough and reliable data collecting has resulted from this, improving the quality of research results across a range of disciplines. It is impossible to overestimate the importance of digital tools in data analysis and interpretation because statistical software, such as SPSS and Excel, has long been a mainstay of social science research, enabling researchers to easily conduct a variety of statistical tests and data manipulations [14]. Digital technologies have also made it easier for researchers to access hard-to-reach and marginalised people, which has led to more inclusive research procedures. To ensure that diverse perspectives are represented in the research process, online surveys, for example, may be broadly dispersed across various demographics and geographical areas. This inclusion is especially significant in social research, since creating successful policies and treatments requires an awareness of all groups' viewpoints [15], [16].

2 Literature Review

(Al-Dmour et al., 2025) [17] Examines the impact of artificial intelligence (AI) and big data analytics on healthcare outcomes in Jordanian healthcare institutionss. According to the results, AI technologies substantially enhance diagnostic accuracy and treatment planning, while big data analytics improve operational efficiency and patient care. It is essential for policymakers, healthcare administrators, and technology developers to comprehend the relationship between AI, big data analytics, and healthcare delivery in order to create effective strategies that enhance operational efficiency and patient care. This investigation proposes that healthcare personnel be provided with exhaustive training, organisational capabilities be improved, and user-friendly AI and big data analytics tools be implemented.

(Aljaunid, 2025) [18] Examines how contemporary technology has affected social research techniques in educational settings, paying particular attention to the ways in which digital technologies affect the procedures of data collection, analysis, and interpretation. The results show that regular technology usage greatly improves research speed and data correctness, giving educational researchers more options for

gathering data and more analytical precision. However, difficulties including the digital divide, ethical conundrums, and data privacy concerns have surfaced as significant barriers to the successful incorporation of technology in educational research. By providing insights into the advantages and difficulties of integrating digital tools and proposing helpful suggestions for future research in an increasingly digitalised educational environment, this study adds to the conversation on technology in educational research.

(John et al., 2024) [10] Thus, the purpose of this work is to examine the many kinds of cutting-edge digital tools used in social science research and how they contribute to higher-quality research. A qualitative analysis was performed on the gathered data. According to the results, there are around six distinct cutting-edge digital tools available for use in social science research, and the calibre of study is greatly influenced by these tools. However, because of their lack of understanding, many researchers continue to underuse these tools. Therefore, in order to provide academic researchers with a comprehensive understanding of the many kinds of digital tools that are accessible and how to use them effectively in order to conduct high-quality research, the article suggests that additional awareness-raising and groundbreaking works be done.

(Ladeira et al., 2024) [19] To further comprehend these performances, a study of the empirical findings from publications addressing big data analytics in the services sector is required. To determine the pertinent aspects of big data analytics and assess artificial intelligence as a possible moderator of its impacts on service performance, this research carried out a meta-analysis based on this justification. The findings show that the adoption of big data analytics is driven by competitive pressure, resources and capabilities, and environmental dynamism. Adoption of big data analytics is more impacted by environmental dynamic than by resources and skills. According to the results, using big data analytics with artificial intelligence improves service performance more than implementing big data analytics without AI.

(Md. Aminul Islam, 2024) [20] To address any study gaps on the influence of big data analytics on digital marketing strategies, a thorough literature review in these areas should be conducted. Since big data has a significant impact on the development of digital advertising strategies and the ways in which big data influences advertising, this research assessed the existing literature on big data applications and found that digital marketing is a broad field. During one of the most devastating pandemics in history, several organisations have found that they may overcome significant obstacles by using the best big data solutions.

(Bryda & Costa, 2023) [21] The importance of qualitative research and the qualitative computer data analysis process in leveraging digital potential and influencing collaborative work is emphasised in this article's critical reflection. This process is essentially a dialectical interaction between the traditional technique and the emerging digital technological world. The researcher's personality and analytical and research processes are shaped by the use of digital tools in qualitative research activities. Additionally, it promotes the growth of new analytical, digital, and information technology (IT) abilities while teaching cooperation and collaborative thinking. It is challenging to envision modern qualitative research and data

analysis in the social sciences and humanities. Our interpretation frameworks are shaped by our exposure to contemporary computer-based qualitative data analysis methods, which also alter the perspective and perception of research issues.

(Rosa et al., 2022) [22] Gives an update on the use of technology in clinical trials during the last five years, citing instances from a range of medical illnesses and with differing degrees of technological integration. The use of real-world data (such as electronic health records) for study recruitment and the integration of artificial intelligence into diagnostic instruments are examples of digital technology integration. With the advent of fully virtual clinical trials, face-to-face contact is no longer necessary. A significant portion of the literature shows how digital methods may enhance clinical trial design and execution. Even while there are still obstacles to overcome, the previous five years have seen positive development, and with good preparation, they may be surmounted.

(Xu et al., 2022) [23] Examine how big data analytics courses contribute to engineering students' skill and employability development via digital education. According to the empirical research, engineering students' career growth aspects, personal qualities, and human capital are all positively impacted by both hard and soft talents. The study's theoretical and practical ramifications expand our understanding of the role of digitisation in improving engineering students' employability and skill sets while also adding to the body of information on engineering education.

(Sabharwal & Miah, 2021) [24] The use of Big Data Analytics (BDA) in the sector has grown significantly in the last few years. The need of BDA capacity in organisations is acknowledged as a data-driven tool to support well-informed decision-making; yet, there aren't many research that have explained BDA capabilities in a manner that may advance our theoretical understanding of using BDA in the organisational domain. Different definitions of big data have been proposed, and this study examines the literature on the categorisation of BDA and its potential. Our results increase the efficiency and use of BDA applications across different organisations.

3 Conclusion

In conclusion, the integration of AI and big data analytics into modern research practices has significantly enhanced operational efficiency, data quality, and service performance across sectors such as healthcare and education. Institutions that prioritize investments in digital technologies can deliver more accurate diagnostics, personalized solutions, and responsive services. To fully realize these benefits, user-friendly tools must be developed, supported by robust infrastructure, comprehensive training, and strong institutional leadership. In education and social research, digital tools facilitate more efficient and collaborative work, improving the quality and scope of qualitative data analysis. However, challenges such as ethical concerns, data privacy, the digital divide, and limited researcher proficiency with digital tools must be addressed. Institutions play a vital role in bridging these gaps through targeted interventions, expanding access to reliable internet and digital resources, and fostering a culture of ethical digital research. Establishing clear guidelines and frameworks for responsible use of digital tools is essential to mitigate algorithmic bias and ensure transparency. By supporting inclusive, ethical, and well-

informed adoption of digital tools, institutions can maximize the transformative potential of technology in research, advancing knowledge and innovation in a responsible and equitable manner.

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