Vol.7 Iss.5 2026 Communication & Education Review
https://doi.org/10.37420/j.cer.2026.071

The Mechanisms of AI-Empowered Research Innovation and the Restructuring of Research Subjectivity

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Abstract:
Artificial intelligence provides new technological support for research innovation by enhancing information processing efficiency, expanding the boundaries of research methods, and facilitating interdisciplinary integration. However, such technological empowerment also gives rise to challenges, including the erosion of research subjectivity, risks to knowledge reliability, and ambiguities in ethical responsibility. From the perspective of research subjectivity, this study analyzes the mechanisms through which generative AI empowers research innovation, examines the dilemmas arising from its application, and explores pathways toward human–AI collaboration. The findings suggest that the value of AI lies not in replacing the research subject but in augmenting human cognitive capacity. Future research innovation should uphold the primacy of the human subject with technology serving as support, achieving a synergy between technological capability and human creative intellect.

Keywords:
artificial intelligence; research innovation; research subjectivity; human–AI collaboration

Introduction

The advancement of scientific research has always been accompanied by the evolution of technological tools. In recent years, generative artificial intelligence (Generative AI), exemplified by large language models, has developed rapidly and has progressively entered various stages of the research process, including literature analysis, data processing, theory construction, and the communication of findings. Existing studies indicate that generative AI has begun to participate in scientific text generation, knowledge synthesis, and research assistance, with its influence gradually extending from conventional information processing to the transformation of knowledge production itself (Gao et al., 2023). AI has evolved from a purely technical instrument into a novel cognitive support system capable of engaging in knowledge analysis, pattern recognition, and content generation, thereby opening new possibilities for research innovation.

AI exerts a dual influence on research activities. On one hand, through capabilities such as natural language processing, knowledge synthesis, and data analysis, AI can improve the efficiency of information acquisition and processing, lower the technical barriers to certain procedural tasks, and expand the space for research

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innovation. On the other hand, research innovation depends not only on information processing capacity but also, and more fundamentally, on the researcher's problem awareness, critical thinking, and original judgment. The uncertainty inherent in AI-generated content, algorithmic bias, and the risk of over-reliance may weaken the researcher's capacity for active inquiry and pose new challenges to academic integrity.

Current scholarship has primarily focused on AI's contributions to research efficiency and knowledge management; yet systematic analyses of how AI reshapes the structural composition of research innovation capacity—and of how to reconcile technological empowerment with research subjectivity—remain insufficient. Accordingly, this paper develops its discussion along three dimensions: mechanisms of empowerment, dilemmas of subjectivity, and pathways for human–AI collaboration. The central argument is that the core value of AI lies not in replacing the research subject but in extending the boundaries of human cognition, thereby achieving a synergy between technological capability and creative intellect.

1. Mechanisms of AI-Empowered Research Innovation

The impact of AI on research innovation is not confined to efficiency gains at the instrumental level; rather, it drives paradigmatic shifts in information processing, research methodology, and knowledge production. Its core function is to augment the cognitive capacity of the research subject, optimize modes of knowledge acquisition, lower the barriers to the application of technical methods, and promote cross-disciplinary knowledge integration.

1.1 Enhanced Information Processing and Reduced Cognitive Load in Research

Research innovation depends first on the accumulation of knowledge; however, as scholarly information proliferates, the traditional approach of manual retrieval, reading, and synthesis incurs considerable time costs. Leveraging natural language processing and knowledge association capabilities, AI can rapidly perform literature screening, content summarization, perspective comparison, and knowledge integration, thereby helping researchers improve information processing efficiency.

During literature review and theoretical mapping, AI can assist researchers in tracing the developmental trajectories of different theoretical schools, identifying research trending topics and contested issues, and providing foundational support for research design. This process does not constitute a simple substitution of information; rather, it represents an extension of the research subject's cognitive capacity. By assuming a portion of repetitive information processing tasks, AI enables researchers to devote greater attention to problem formulation, theoretical analysis, and creative thinking, thus facilitating a shift in the allocation of research effort from lower-order information processing toward higher-order knowledge creation.

1.2 Strengthened Data Analysis Capabilities and Methodological Innovation

Contemporary scientific research increasingly relies on complex data and technical methods, and expanding data scales have raised the methodological demands placed on research activities. AI can assist with data processing, code development, model construction, and the analysis of results, thereby lowering the technical threshold for the application of research methods.

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AI has demonstrated its value for methodological innovation across diverse research domains. In the social sciences, it can support text analysis, data classification, and public opinion research; in the natural sciences, it can contribute to experimental simulation, pattern recognition, and predictive analysis. This shift moves research activities from a tool-operation orientation toward a problem-solving orientation. Empirical research has found that generative AI can, under certain conditions, enhance individual creative performance, though its effectiveness depends on the quality of interaction between the human user and the AI system (Lee & Chung, 2024). Importantly, AI cannot supplant the researcher's methodological judgment; instead, it demands that researchers develop the integrated competence to understand, evaluate, and apply technology-generated results.

1.3 Interdisciplinary Integration and the Transformation of Knowledge Production

Scientific innovation depends on the cross-fertilization of knowledge across different fields, yet long-established disciplinary boundaries have also increased the costs of interdisciplinary research. With its broad data foundation and capacity for knowledge synthesis, AI creates new conditions for dialogue and integration across disciplines.

AI can help researchers rapidly grasp the fundamental concepts, research methods, and theoretical frameworks of other fields, thereby facilitating the flow of intellectual resources across disciplinary boundaries. For example, the social sciences can draw on AI to conduct large-scale text analysis, while the natural sciences can employ AI for complex system prediction. In this way, research innovation gradually shifts from deepening inquiry within a single discipline to collaborative exploration across multiple domains.

2. Dilemmas of Research Subjectivity in AI Application

While AI offers new technological conditions for research innovation, technological empowerment does not automatically translate into enhanced innovation capacity. Research innovation is, in essence, a process of knowledge creation grounded in the exercise of human subjectivity. As AI becomes deeply involved in research activities, how to safeguard the researcher's problem awareness, evaluative judgment, and creative capacity has emerged as a critical issue for the development of research in the age of intelligence.

2.1 Technology Dependence and the Erosion of Researcher Competence

Problem awareness and independent judgment constitute the foundation of research innovation. Scientific inquiry is not merely information processing but the formation of new understanding through the observation of reality, the critical examination of theory, and the identification of problems. The convenience afforded by generative AI, however, may cause research practice to drift from active exploration toward passive acquisition.

If researchers become overly reliant on AI for topic selection, literature synthesis, and theoretical analysis, their own capacity for problem identification may be diminished. UNESCO has emphasized that the application of generative AI should adhere to a human-centered principle, ensuring that human judgment and the researcher's sense of responsibility are not undermined in the course of technology use (UNESCO, 2023). Moreover, when AI substitutes for certain foundational research training activities, it may also impede the

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development of researchers' skills in reading, analysis, and theory construction. It is therefore essential that technology application avoid a slide from assisting innovation to supplanting it.

2.2 Algorithmic Generation and Risks to Knowledge Reliability

Research activities are governed by the fundamental principles of truthfulness and verifiability; yet AI generates content primarily on the basis of data patterns, and its outputs may contain factual errors, logical inconsistencies, and informational distortions. Studies have shown that, because large language models generate content through probabilistic prediction, they may produce fabricated facts, erroneous citations, and unreliable information, thereby posing challenges to the veracity of research knowledge (Ji et al., 2023).

In research practice, such risks manifest chiefly as errors in citation, biases in theoretical interpretation, and inaccuracies in data analysis. If researchers adopt AI-generated content without verification, the reliability of research outputs may be compromised. AI outputs must therefore undergo professional evaluation and scientific verification by the research subject, establishing an application protocol of technology-assisted generation, human appraisal, and knowledge validation.

2.3 Generative Patterns and the Homogenization of Scholarly Expression

Research innovation is reflected not only in research findings but also in the processes of theoretical articulation and intellectual construction. Although AI can improve the efficiency of textual organization, its generative logic relies primarily on existing knowledge patterns, which tends to produce standardized forms of expression. Further research has found that when AI-generated content continuously re-enters the cycle of knowledge production, it may lead to homogenization within the information ecosystem and a contraction of the space for innovation (Shumailov et al., 2024).

If scholarly writing relies excessively on AI for structural design and language generation, the result may be a convergence among different research outputs in both structure and expression, thereby diminishing the role of individual thought and theoretical creativity in published work. AI may thus serve to refine expression but must not replace the researcher's process of intellectual construction.

2.4 Data Security and the Boundaries of Academic Responsibility

AI applications also raise issues of research ethics and accountability. Research activities involve sensitive materials such as experimental data, research protocols, and intellectual property, and the use of open AI platforms may entail risks of data leakage.

At the same time, as AI participates in the research process, the boundaries of academic responsibility require further clarification. While AI can undertake tasks of analytical support and content generation, the truthfulness, rigor, and originality of research outputs must remain the responsibility of the research subject. It is therefore necessary to establish clear standards for technology use to ensure the safe and orderly conduct of research activities.

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3. Pathways for Enhancing Research Innovation Through Human–AI Collaboration

Faced with both the technological opportunities and the risks to subjectivity that AI presents, research innovation must neither reject AI out of concern over technological displacement nor abandon the researcher's own judgment in the pursuit of efficiency. A more viable approach is to construct, on the premise of upholding research subjectivity, a collaborative human–AI framework in which AI serves as an auxiliary and human creativity remains at the core, ensuring that technology genuinely serves knowledge production and innovation.

3.1 Strengthening the Researcher's Capacity for Problem Identification

The starting point of research innovation lies in posing questions, not in obtaining answers. AI is better suited as a collaborative partner that augments human cognitive capacity rather than as a substitute for human decision-making (Mollick, 2024). Researchers should begin from real-world needs and accumulated scholarly understanding, completing problem identification, theoretical judgment, and research design before turning to AI to refine literature organization, information retrieval, and the presentation of results. Only by keeping problem formulation, value orientation, and directional judgment firmly in the hands of the research subject can one prevent research activities from being steered by technological logic, ensuring that innovation remains centered on genuine problems.

3.2 Enhancing the Researcher's Evaluative Judgment

AI can provide information rapidly, but its outputs are not inherently equivalent to reliable knowledge. Researchers should treat AI-generated content as reference material rather than definitive conclusions and verify it through primary source checking, cross-referencing of data, and examination of theoretical coherence. Particular caution is warranted in areas such as citation, data interpretation, and conceptual definition. Establishing a workflow of generation, verification, and revision is essential to preserving scholarly rigor.

3.3 Achieving Complementary Strengths Between AI and the Research Subject

The strength of AI lies in the efficient handling of repetitive, procedural, and computational tasks, whereas the strength of the research subject is manifested in problem identification, theory construction, and integrative judgment. The two should form a clearly delineated and mutually complementary collaborative relationship. Researchers may employ AI for information screening, data processing, and draft preparation, but core argumentation, scholarly judgment, and final decision-making must remain with the human agent. Only by clearly defining the boundaries of technology can one raise efficiency while safeguarding the threshold of originality.

3.4 Ensuring Accountability in the Research Application of AI

With AI entering the research domain, issues of data security, attribution of outputs, and the boundaries of responsibility have become more pressing. Scholars have argued that generative AI is reshaping the structure of research accountability, and that transparent standards of use and ethical governance mechanisms are need-

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ed to ensure the reliability of scientific research and the proper attribution of responsibility (Pournaras, 2023). Researchers should exercise strict control over the scope of sensitive information entered into AI systems, preventing the exposure of unpublished data, experimental protocols, and intellectual property. Furthermore, necessary transparency should be maintained throughout the process of producing research outputs—disclosing the use of AI to enhance the traceability of the research process. Looking ahead, there is also a need to refine relevant ethical guidelines and management frameworks, making explicit that AI may only assist research and cannot replace the accountable research subject.

Conclusion

The rapid development of AI is driving profound changes in research practice, with its influence extending beyond the application of technical tools to encompass the modes of knowledge production, the structural composition of research capacity, and the operational mechanisms of academia. The analysis presented in this paper demonstrates that AI provides new technological support for research innovation by enhancing information processing efficiency, broadening the applicability of research methods, and facilitating interdisciplinary knowledge integration, thereby propelling research from a traditional knowledge-accumulation model toward an intelligent collaborative paradigm.

Nevertheless, the technological advantages of AI do not automatically translate into improved research innovation capacity. Because AI entails problems such as generative bias, technology dependence, and the erosion of subjectivity, its deep application may also challenge the researcher's problem awareness, evaluative judgment, and creative capacity. The key to research development in the age of intelligence, therefore, lies not in choosing between technological replacement and technological rejection, but in constructing a human–AI collaborative relationship that unifies technological empowerment with the preservation of human subjectivity.

Future research innovation must adhere to a developmental orientation in which the human subject takes the lead and AI serves in a supporting role. AI should serve to extend the researcher's cognition and support innovative practice, rather than supplant human intellectual creation. Only by harnessing the advantages of technology while upholding research subjectivity, reinforcing critical judgment, and refining ethical standards can a deep integration of AI and research innovation be achieved—advancing the system of knowledge production toward a more open, efficient, and creative future.

References

[1]Gao, C. A., Howard, F. M., Markov, N. S., et al. (2023). Comparing scientific abstracts generated by ChatGPT to real abstracts. npj Digital Medicine, 6, 75.

[2]Lee, B. C., & Chung, J. (2024). An empirical investigation of the impact of ChatGPT on creativity. Nature Human Behaviour, 8, 1906–1914.

[3]UNESCO. (2023). Guidance for generative AI in education and research. Paris: UNESCO.

[4]Ji, Z., Lee, N., Frieske, R., et al. (2023). Survey of hallucination in natural language generation. ACM Computing Surveys, 55(12), 1–38.

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[5]Shumailov, I., Shumaylov, Z., Zhao, Y., et al. (2024). AI models collapse when trained on recursively generated data. Nature, 631, 755–759.
[6]Mollick, E. (2024). Co-intelligence: Living and working with AI. New York: Portfolio.
[7]Pournaras, E. (2023). Science in the era of ChatGPT, large language models and generative AI: Challenges for research ethics and how to respond [Online article]. Retrieved July 9, 2026, from https://arxiv.org/abs/2306.07731

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