Bridging Minds and Machines: Emotional Intelligence as Intellectual Capital for Human-AI Collaboration

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Abstract: As AI evolves from a tool to a key collaborator and co-creator across industries, its effectiveness is influenced by humans' abilities to guide, interpret, and refine AI-generated outputs. This study examines how self-awareness, emotional regulation, empathy, adaptability, emotional expression, and interpersonal skills- the core emotional intelligence competencies- moderate human-AI collaboration for creative problem-solving. The research positions emotional intelligence within the intellectual capital framework as a dimension of human capital that enhances both individual performance and organizational capital. Through empirical research with marketing professionals, the study ranks emotional intelligence competencies based on how they improve AI-generated creative outputs. The findings reveal that emotional expression is the most effective competency for enhancing creative outcomes, while adaptability shows negligible influence. This evidence suggests that professionals who can communicate emotional context effectively generate more innovative AI responses than those who focus solely on technical parameters. The study further examines professionals' specific interaction strategies, comparing emotionally informed prompt engineering, iterative refinement, and role-based interaction approaches. The results indicate that prompt clarity consistently ranks as the most effective strategy for enhancing AI responses, while emotional context remains significantly underutilized despite empirical evidence supporting its benefits. This gap between research findings and current professional practice highlights an important opportunity for targeted emotional intelligence development within organizations adopting AI technologies. Indeed, while the emotional context of human-AI interaction remains underutilized despite its proven benefits, organizations that invest in emotional intelligence competencies can achieve improved technological integration, effectively connecting human creativity with AI capabilities. The research presents a structured framework for developing these competencies, with a particular emphasis on emotional expression and contextual prompting techniques. These findings carry significant implications for businesses creating AI implementation strategies, educators designing curricula for future professionals, and policymakers setting guidelines for responsible AI adoption, all while aiming to enhance AI-driven creativity without sacrificing human-centered innovation principles.

Keywords: Keywords: Human-AI collaboration (HAC), Artificial intelligence (AI), Creative problem-solving (CPS), Emotional intelligence (EI), Intellectual capital (IC), Knowledge management

1. Introduction

Intellectual Capital (IC) is widely recognized as a fundamental intangible asset that facilitates innovation, strategic agility, and sustained performance within organizations. It is typically categorized into three components: human capital, which pertains to employees' knowledge, skills, experience, and motivation; structural capital, covering organizational routines, systems, databases, and intellectual property; and relational capital, involving the relationships and networks that organizations maintain with external stakeholders such as customers, suppliers, and partners (Kianto et al, 2020; Melnichuk, 2023).

Among these, human capital is often considered the foundational element because it directly contributes to the formation and reinforcement of structural and relational capital (Kianto et al, 2020). Companies that invest in staff expertise and development are better positioned to transform personal knowledge into organizational assets. This type of relationship is especially important for small and medium-sized enterprises (SMEs), where resource limitations make the effective use of IC critical (Melnichuk, 2023).

Recent empirical research confirms the significant impact of intellectual capital (IC) on organizational outcomes, particularly in SMEs and knowledge-driven environments. Studies indicate that companies with stronger IC achieve better performance, especially when human, structural, and relational elements are effectively integrated with knowledge-sharing practices and innovation initiatives (Jegerson et al, 2024).

In parallel, a study by Ayranci and Çolakoğlu (2014) explores the connection between Emotional Intelligence (EI) and IC by analysing how top managers' emotional capabilities influence their perceptions of IC components. Their work shows that leaders who possess self-awareness, empathy, and social fluency perceive and evaluate human capital, organizational commitment, and knowledge sharing differently than those without these emotional competencies. Although EI is not formally classified as a component of IC, these findings suggest that

emotional capabilities may support the effective interpretation and utilization of IC, particularly through their impact on managerial judgment related to human and structural capital.

The evolving integration of Artificial Intelligence (AI) into organizational workflows has introduced new opportunities and challenges for human capital. In particular, the effectiveness of human-AI collaboration increasingly relies on EI as a key enabler of meaningful interaction and co-creation between humans and machines.

As Artificial Intelligence (AI) becomes increasingly embedded in all industries, its role shifts from being a tool to a co-creator, giving rise to the concept of "assisted creativity", where AI collaborates with humans to expand outcomes rather than acting independently. Effective Human-AI Collaboration (HAC) depends on the user's ability to guide, evaluate, and refine AI outputs, especially in creative problem-solving contexts. EI plays a central role in the current process, helping users generate context-rich, emotionally attuned prompts and make informed final decisions. Research shows that human emotions and their expression improve both the interaction and the efficiency of AI-generated responses (Ameen et al, 2022; Vinchon et al, 2023). In practice, human involvement typically unfolds in two stages: problem identification, where users craft prompts, and final verification, where they review and validate outputs—each stage requiring emotional awareness and cognitive engagement.

The entire collaboration process requires emotional development and depth, allowing AI to learn from human input as it gains experience (Waikar, 2020). To produce more contextually relevant and creative results with AI, professionals will need to enhance their EI competencies in cognitive flexibility, social awareness, and adaptability (Ameen et al, 2022).

The biggest challenge is the lack of a structured framework for determining the factors that influence creativity in relation to AI. This encompasses both emotional aspects (for example, how to be empathetic or adaptable) and non-emotional aspects (such as formulating prompts and managing cognitive complexity) (Khare et al, 2024; Raz et al, 2023). Although EI competencies are acknowledged as crucial and impactful for HAC, many elements of their role in Creative Problem-Solving (CPS) remain ambiguous (Zhai and Wibowo, 2023). Without a clearly defined approach to implementing EI-driven strategies in HAC, AI will likely remain a technical tool rather than a true partner in creative tasks.

Recent studies on AI claim to enhance human creativity within organizations (Ameen et al, 2022), yet there remains a gap in understanding how to systematically improve HAC performance in creative industries. The primary objective of this study is to enhance HAC in cyber-physical systems by identifying and developing specific core competencies across various fields. Furthermore, one of the research goals is to prioritize the most essential EI competencies for HAC, aiming to foster a structured approach to boosting team performance and innovation. By addressing this research objective, we close knowledge gaps and offer actionable strategies to strengthen human-AI synergy in creativity-driven industries.

The current project will focus on developing EI competencies of key HAC in the CPS CREATIVE process, specifically within the marketing industry. The choice of the marketing field is due to CPS being crucial for business success, generating competitive advantage, and fostering long-term growth and profitability (Ameen et al, 2022; Titus, 2000). AI has facilitated progress in marketing by enabling more rapid real-time data analysis, product optimization, tracking product trends, analysing user engagement, and making informed content creation decisions (Ma and Sun, 2020; Stone et al, 2020). Consequently, the convergence of AI-driven efficiency and human creativity makes marketing an excellent area to examine HAC in CPS.

2. Literature Review

2.1 Human-AI Collaboration

HAC consists of collaborative entities that mutually support one another to achieve shared goals. The human oversees the AI outcomes in the current partnership while adjusting and optimizing the results for improved performance (Terveen, 1995; Vössing et al, 2022).

The success of Human-AI teams lies in their ability to achieve objectives by allowing both groups to function within their areas of expertise and natural leadership skills. The computational power of AI facilitates information analysis and prediction tasks, while humans maintain control over ethical decision-making, as well as empathetic and creative processes. Human-led performance consistently surpasses AI systems when tasks require strategic thinking, emotional insight, and creative skills. The objective may involve routine process work or optimization, areas where AI exhibits superior capabilities. Research by Hemmer et al (2023) indicates that

collaborative efforts between humans and AI systems yielded optimal results, with the human-machine team making 0.15 classification errors, compared to 0.30 and 0.25 errors recorded by individuals alone, respectively.

According to Anantrasirichai and Bull (2021), AI is a tool that eliminates laborious tasks, allowing humans to engage in more complex and creative processes. In marketing, the interaction between humans and AI is referred to as “balanced reinforcement” - AI fosters imagination, visualization, and abstract thinking, resulting in enhanced human creativity (Ameen et al, 2022).

2.2 Defining Creative Problem Solving

Many different fields, including architecture, engineering, public administration, art, entrepreneurship, and numerous other industries that impact human development, rely on the availability of creative solutions (Cardoso and Badke-Schaub, 2011). According to Ameen et al (2022), creativity arises from new and valuable ideas in product design, branding, and customer service. These tasks require out-of-the-box thinking and flexibility, aligning them with the problem-solving process. An enterprising individual's ability to effectively use creative problem-solving is fundamental in determining their level of innovation (Benner and Tushman, 2003; March, 1991).

2.3 Prompt Engineering

Prompts are arguably key to working with AI, and prompt engineering is one way for humans and AI to collaborate by exploring potential solutions based on thoughtfully structured instructions. The queries are framed appropriately so that the model can be guided towards the desired outcome (Brown et al, 2020). AI models lack autonomy, making the formulation of queries essential for the quality of responses (Zamfirescu-Pereira et al, 2023). Context, instructions, or examples that are well-worded queries assist the model in reaching the desired topic, style, or format. An effective method for creating queries enables the model to respond more accurately, logically, and usefully within the context of a specific task or knowledge domain.

2.4 Defining Emotional Intelligence

EI, as defined by Mayer et al (2004), is “the ability to reason about emotions and use emotions to improve thinking. " EI involves identifying, interpreting, and controlling emotional states, along with understanding the effects of these emotions on others' behaviour and how people react to emotionally charged situations.

2.5 Emotional Intelligence Competencies

Special EI competencies hold significant value, particularly in CPS and staff development. According to the research by Mortillaro and Schlegel (2023), emotion regulation and perception are crucial variables for maintaining focus and encouraging innovation in dynamic contexts. For instance, emotion regulation helps professionals manage stress during high-pressure tasks, while emotion perception enables them to identify emotional cues in themselves and others.

2.6 Factors Affecting Human-AI Collaboration

The purpose of this study is to determine the main factors affecting HAC, that contribute to the improvement of creativity and problem-solving ability of the AI.

2.6.1 Emotional factors

EI competencies, like empathy and openness to experience, extend the quality of prompts and facilitate creativity outputs from AI systems (Raz et al, 2023; Mortillaro and Schlegel, 2023).

Empathy enables individuals to consider the effects of AI-driven decisions on human beings, such as tailoring AI-generated content to align with customers' emotions and the experiences of employees (Heyns, 2024). Furthermore, empathy enhances HAC by helping people recognize perceived emotions and adapt AI outputs to better reflect human feelings and cultural nuances (Kolomaznik et al, 2024).

Self-awareness, recognizing personal strengths and challenges, allows individuals to engage with AI thoughtfully and purposefully. By understanding their emotional responses, they can more effectively assess AI-generated insights and avoid emotional biases that may stifle creativity.

Trust is one of the most critical emotional factors in relation to HAC in terms of both cognitive and affective dimensions. If users trust AI systems, they interact more intensely, regard AI’s recommendations as authentic, and are more inclined to include AI’s insights into the decision–making process.

Another fundamental aspect is *rapport*, which facilitates effective HAC. Connecting and engaging with the AI results in a perception of the AI as a partner rather than just a tool. The development of rapport is often supported by consistent AI responses, personalized interactions, and emotionally attuned feedback loops, all of which enhance human acceptance and engagement (Kolomaznik et al, 2024).

Finally, *anthropomorphism*, or the process of humanizing AI, influences users' emotional connection to AI systems. Studies show that the more individuals view AI as a relatable entity, the greater the engagement, the deeper the trust, and the better the collaboration. While not mandatory, the anthropomorphic factor, as shown by Kolomaznik et al (2024), positively affects users' comfort and emotional responsiveness during interactions with AI.

2.6.2 Non-emotional factors

Clear instructions greatly enhance AI responses, leading to accurate, relevant, and organized content with minimal confusion. Specific guidelines regarding response format, tone, or length boost AI performance and practical value (Raz et al, 2023; Ekin, 2023; Park & Choo, 2024). For example, instead of asking, "Explain what AI is," a more effective prompt would be, "Summarize three key applications of AI in marketing in two sentences." Vague prompts result in inconsistent responses; therefore, users may benefit from checking whether their instructions are clear. Encouraging AI to seek clarification, such as "If additional details are needed, please ask before responding," reduces errors and aligns results with user expectations (Lo, 2023; Park & Choo, 2024; Bansal, 2024).

Iterative refinement enhances response quality by testing and adjusting prompts based on AI outputs. By altering wording, providing context, or reorganizing queries, users can fine-tune results to align with their intentions (Dang et al, 2022; Abdoelrazak, 2023; Rodriguez et al, 2023). This approach enables AI to cater to specific needs, boosting both accuracy and creative potential.

Step-by-step prompting breaks complex tasks into logical sequences, enhancing AI reasoning and precision. Chain-of-Thought techniques guide AI to explain its thought process before reaching conclusions, creating transparency and organized problem-solving. For instance, instead of simply asking, "If a car travels at 60 miles per hour for 3 hours, how far does it travel?", a more effective Chain-of-thought (CoT) prompt would be, "Let's solve this step by step. First, recall the formula for distance. Then, substitute the values for speed and time. Finally, calculate the total distance travelled" (Raz et al, 2023; Karakaya, 2025; Wu et al, 2022).

Role assignment enhances domain-specific accuracy and relevance. Guiding AI with "You are a financial analyst; provide an investment strategy for beginners" yields more structured insights (Wu et al, 2023; Park & Choo, 2024; Sikha et al, 2023). Providing background context about industry specifics or audience details further improves outputs.

Applying constraints such as word limits, format requirements, and topic boundaries encourages well-structured AI content. Clear guidelines, like "Explain machine learning in two bullet points," steer AI focus and help avoid unnecessary wordiness (Ekin, 2023; Lo, 2023; Rodriguez et al, 2023).

Prompt chaining preserves context and supports logical flow in AI interactions. Instead of a single broad query, structured sequences like "List three marketing strategies; compare their effectiveness; recommend one for small businesses" enhance organization and coherence (Bansal, 2024; Sikha et al, 2023).

AI literacy helps users experience less frustration when facing AI errors and better understand system capabilities and limitations (Beretta, 2023; Ng et al, 2021; Kolomaznik et al, 2024). Misconceptions about AI capabilities can lead to overreliance or scepticism, emphasizing the need for targeted education to enhance interactions. These misconceptions can result in overreliance or distrust, underscoring the importance of targeted AI education initiatives to improve user engagement and response evaluation.

Striking a *balance* between user-defined constraints and AI's generative capabilities leads to original yet relevant outputs. Allowing for creative flexibility while maintaining control over factual correctness enhances AI-assisted innovation and problem-solving (Raz et al, 2023; Karakaya, 2025; Zhang et al, 2024; Sikha et al, 2023). *Adaptive prompts* tailor AI responses based on user expertise and task complexity.

Additionally, retrieval-augmented generation techniques incorporate external knowledge sources into AI responses, enhancing factual accuracy and reducing AI hallucinations (Rodriguez et al, 2023; Zhang et al, 2024; Bansal, 2024).

3. Methodology

Moving forward to the methodology part, the process started with a comprehensive literature review. The literature review includes reliable and recent articles, conference papers, and educational websites that are highly relevant to the topic of integrating AI and human creativity and enhancing team collaboration. The following phases were the EI test and survey distribution, followed by collecting data from both and analysing their correlation.

3.1 Emotional Intelligence Test

The EQ ProfDialog assessment evaluates workplace emotional intelligence across key dimensions, including self-awareness, emotional regulation, empathy, adaptability, emotional expression, and interpersonal skills. The certified test consists of 117 questions that assess respondents on 11 emotional intelligence factors using a scale from 1 to 10, providing detailed feedback for each area.

Built-in validity safeguards, such as lie detection and contradiction tracking, identify questionable responses to uphold data integrity. The test was selected specifically for its availability in the Russian language and its cultural relevance to the study's participants: marketing professionals in Kazakhstan. Its adherence to European reliability standards makes it a trusted tool widely used by Kazakh companies for staff evaluation purposes.

3.2 Survey on AI Usage in Marketing

The purpose of this survey is to analyse the AI usage among specialists in the field of marketing. It consists of six questions that focus on the frequency of AI usage in the workplace and whether AI-generated responses are creative and effectively address the given prompts. Additionally, the survey includes questions that assess the types of tasks respondents utilize AI for and the strategies and skills they apply to obtain the desired responses, enhancing their collaboration with AI. Furthermore, respondents are asked to answer a question regarding the limitations AI in their work. All these questions aim to identify correlations between EI competencies and HAC.

The survey results indicate that most respondents (30 out of 37) reported frequently using AI in their professional activities, suggesting that AI plays a significant role in their daily marketing workflows (Figure 1). A smaller subset of respondents (6) stated they use AI occasionally, while only one reported using it rarely. Notably, no participants chose the “never” option, emphasizing that all surveyed individuals incorporate AI into their work to some extent. This confirms the survey population's relevance for studying HAC and EI in marketing contexts.

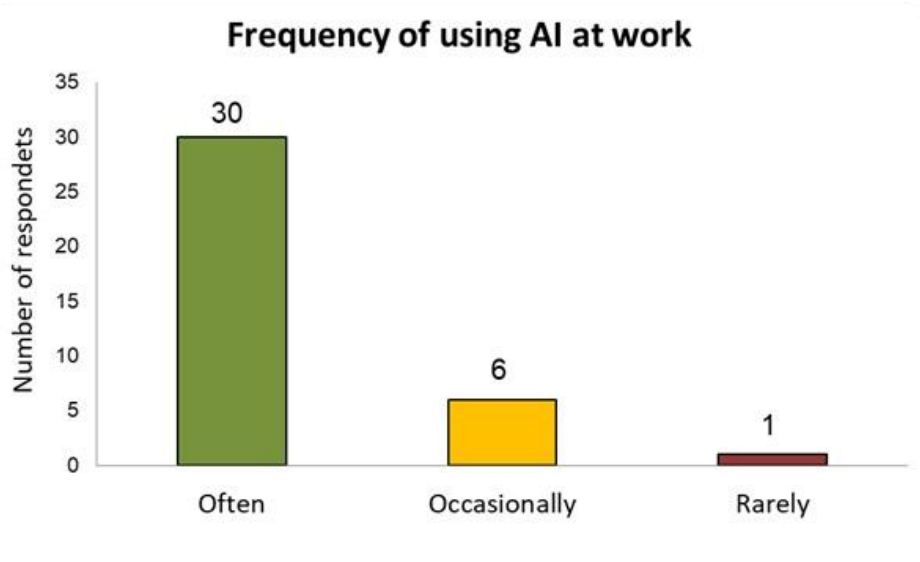

Figure 1: Frequency of using AI at work

4. Discussion

According to the survey results, the way AI is utilized influences its creativity. Users who employ AI for content creation and data analysis achieve more innovative results compared to those who use it for task automation.

This confirms that AI serves more effectively as a creative partner than as a fully autonomous problem-solving tool.

Additionally, one of the key findings of the research is that the e*xpression of emotions* positively correlates with the creativity of responses. Participants with higher levels of emotional expression (average = 3.63) rated the results generated by AI as more creative compared to those with lower levels of emotional expression (average = 3.00). A statistically significant relationship was indicated by a value of p = 0.047. This suggests that individuals who can effectively express emotions create cues that lead to more innovative and original AI responses, a finding that aligns with previous literature reviews (Hemmer et al, 2023; Li et al, 2023).

Other characteristics of emotional intelligence, such as adaptability, self-regulation, and emotional perception, did not demonstrate significant differences regarding AI creativity. For instance, the average adaptability level was nearly identical (4.105 for less creative users compared to 4.062 for more creative users; p = 0.889).

Additionally, Figure 1 presents the survey results, indicating that emotional context is one of the least utilized strategies for enhancing AI responses. This contrasts with current research suggesting that emotionally charged prompts effectively encourage AI towards more creative outputs (Li et al, 2023). However, suppose a gap exists between what the literature suggests and common practice. In that case, it may indicate that professionals are not fully aware of or are not utilizing emotionally appropriate strategies when working with AI.

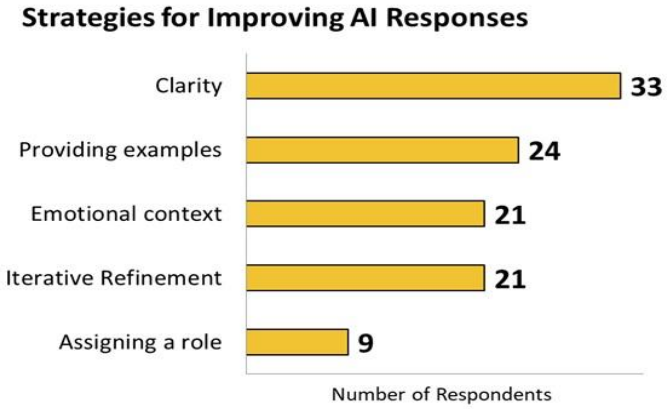

Figure 2: Strategies for Improving AI Responses

Clarity in prompting is one of the most important factors for AI creativity. The results of the survey (Figure 2), along with the literature review, indicate that well-structured, specific, and detailed prompts lead to significantly better quality in AI-generated responses. Additionally, respondents ranked clarity as the most effective strategy for enhancing the quality of AI outputs, while task misinterpretation was identified as the most common limitation of AI (Figure 3).

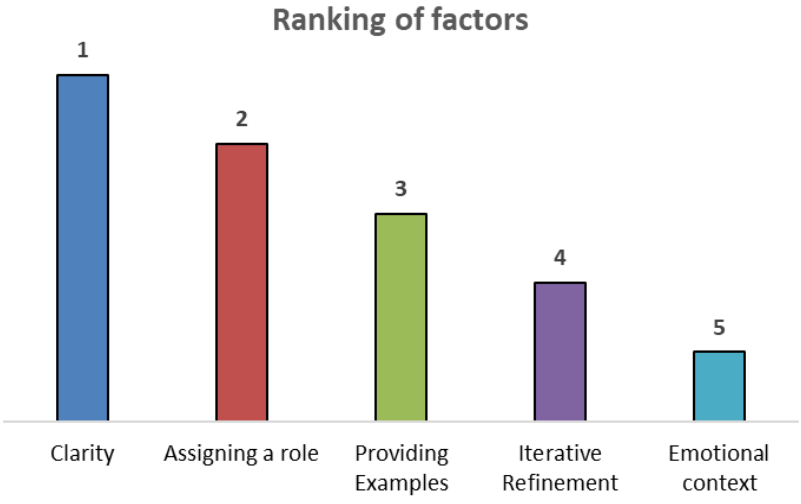

Figure 3: Ranking of factors based on respondents' experience

Iterative refinement emerged as another significant factor and became a widely adopted strategy in the survey. Consequently, this approach allows users to modify and enhance AI responses through repeated interactions, making these responses progressively better aligned with their imagination and context. Literature supports this, indicating that revising prompts improves the originality and depth of AI-generated outputs (Li et al, 2023). The implication is that professionals who do not fully leverage AI's contextual reasoning, may be helped by appropriate training in this matter.

5. Conclusion

This study contributes to the discussion on IC by demonstrating the role of EI as a strategic enabler. In AI-augmented environments, where knowledge work and CPS intersect, emotionally intelligent professionals serve as key mediators of value - translating technological potential into innovative outcomes. Among the examined competencies, emotional expression significantly influences the richness and creativity of AI outputs, providing empirical support for the strategic integration of EI into organizational innovation processes.

The research positions EI not as a peripheral human trait but as a form of embedded IC - a human capability that actively contributes to the co-evolution of organizational knowledge systems. When organizations invest in cultivating EI, they reinforce the development of structural capital, such as emotionally aware prompt engineering frameworks, and relational capital, through trust-building mechanisms that boost engagement with AI systems.

Despite the clear benefits, current practices indicate a disconnect between the acknowledged significance of EI and its application in HAC. By implementing organizational interventions that incorporate EI development into professional training and knowledge management systems, companies can foster a more effective synergy between human and machine agents engaged in technological adoption. This strategy is not only efficient but also emotionally intelligent and geared towards innovation.

By framing EI as an active enabler of IC formation, this study expands existing value-creation models in digital contexts. It also provides a pathway for enhancing organizational resilience, creativity, and learning in the age of AI.

Ethics declaration: Ethical approval for this study was obtained on 18 October 2024. The study was reviewed in accordance with national and international ethical standards for research involving human participants. All participants were informed about the study's purpose and procedures and provided written consent before participating. Data confidentiality, anonymity, and security were maintained throughout the project in accordance with GDPR and the national data protection laws of the Republic of Kazakhstan.

AI declaration: The authors declare that no generative AI tools were used to create the content, ideas, or theories presented in this manuscript. Under close human supervision, AI-assisted technologies were employed solely to enhance language clarity and readability. All AI-refined content was meticulously reviewed, edited, and validated by the authors to ensure accuracy and coherence. The authors acknowledge that while AI may assist in improving expression, it can also introduce errors or biases. Consequently, the final manuscript reflects human critical judgment and maintains scholarly integrity.

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