J. Management and Humanity Research
Vol. 10, 2023, 75-86
ISSN: 2582-7766 *(online)*
Published on 31 December 2023
www.researchmathsci.org
DOI:http://dx.doi.org/10.22457/jmhr.v10a062467

Journal of
Management and
Humanity Research

The Outcomes of Human-AI Interaction: A Literature Review

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Received 12 December 2023; Accepted 30 December 2023

Abstract. As artificial intelligence technology rapidly advances, human-AI interaction has become an increasingly important work mode in modern society, where humans and AI systems collaborate to complete complex tasks. Despite its potential to expand human capabilities, enhance work efficiency, and optimize resource allocation, the reality is exceedingly complex. During the process of human-AI interaction, multidimensional effects have emerged, leading to AI being seen as a "double-edged sword." To comprehensively clarify the various outcomes produced in human-AI interaction, by considering positive effects and negative effects, this paper constructs a two-dimensional theoretical framework based on a systematic literature review, so as to identify and systematically summarize the results of human-AI interaction at both the organizational and individual levels. Exploring and understanding the potential effects of human-AI interaction not only prepares us to handle the immediate challenges but also to harness AI's full potential responsibly and ethically. It enables society to anticipate changes and plan interventions that promote human welfare and societal progress.

Keywords: Human-machine relationship, Human-AI interaction, Human-AI collaboration, AI trust, effects

1. Introduction

The emergence of human-AI interaction and collaboration issues stems from the rapid development and widespread application of artificial intelligence technology. With continuous advancements in computer technology and machine learning algorithms, AI

has been able to independently complete complex tasks in many fields, such as content generation (like ChatGPT), image recognition and generation (like Sora), speech recognition and dialogue (like voice assistants and chatbots), natural language processing, and even anthropomorphism. However, the application of current AI systems still faces many constraints, such as the lack of human emotions, innovation, and judgment, and difficulty in gaining full human trust, which in turn limits the level and quality of human-machine interaction [1]. Therefore, to better leverage the potential of AI technology, it is necessary to combine human wisdom and creativity through human-AI interaction, integration, and co-creation to continuously improve the effectiveness of human-AI interaction. In other words, the expected outcomes of human-AI interaction issues lies in how to combine human wisdom and machine intelligence to complete complex tasks together, emphasizing cooperation and coordination between humans and AI, with the goal of achieving more efficient and higher-quality work and learning outcomes[2-3].

The key to successful interaction between humans and AI lies in the effective division of labor and cooperation between humans and intelligent systems. In terms of division of labor, AI can handle a large amount of factual data through various data analyses and algorithmic processing to provide accurate, comprehensive informational support, while humans can make decisions and take actions based on subjective judgments, experiential knowledge, and value considerations. The effective interaction process relies on mutual communication and understanding between humans and AI; humans need to understand the working principles and application scenarios of AI systems to better guide them in completing tasks; similarly, AI also needs to understand human intentions and needs to provide services and products that better meet human demands. This mutual communication and understanding process needs to be based on trust and collaborative working mechanisms between humans and AI systems.

Although human-AI interaction has the potential value of improving work efficiency and optimizing resource allocation, fully realizing the positive effects of human-AI outcomes faces many challenges. The integration of AI systems into human activities and decision-making processes still confronts numerous concerns and challenges, including human-AI trust, social ethics, privacy and security, and sustainable human development [4]. These concerns not only seriously affect the willingness and ability of humans to effectively collaborate with AI systems, but also determine the final collaboration outcomes and quality. To systematically describe the content structure and formation mechanisms of human-AI interaction, this article will systematically review the outcomes of human-AI interaction, and logically organize the related contents with a two-dimensional framework which includes both the positive effects and the negative effects.

2. Positive effects of human-AI interaction

2.1. Perspective from organization

Artificial intelligence technology has already seen extensive application in organizational operations and business management and is gradually changing the way various industries operate. The application of AI is not limited to improving efficiency and reducing costs, but also includes enhancing decision-making, improving customer experience, and fostering innovation. The Technology Support School believes that as AI technology matures and the number of application cases increases, enterprises will be able to continuously improve their ability to use AI to solve business and decision-making problems, thereby driving organizational development and social progress.

(1) Improving work efficiency

The basic principle of improving work efficiency through human-AI interaction is to combine human creativity, intuition, and decision-making capabilities with AI's data processing, analysis, and automation capabilities, thereby creating an efficient work model. Scholars have provided mechanistic explanations from the perspectives of task automation and decision support. For example, Davenport & Kirby [5] point out from the perspective of task automation that AI can automate many repetitive and time-consuming tasks, such as data entry, analysis, and report generation, thereby freeing human employees to engage in higher-value activities. Davenport & Ronanki [6] note that by providing data-driven insights and predictions, AI can help humans develop faster, more accurate task execution plans. Brynjolfsson & McAfee [7] have researched from an enhanced collaboration perspective and found that AI tools and platforms can facilitate communication and collaboration among team members, thereby increasing team efficiency. However, achieving work efficiency improvements depends on the conditions of human-machine collaboration and interaction mechanisms. As Grewal et al. [8] emphasize from the perspective of technological adaptability and integration, the compatibility of AI technology with existing workflows and systems and the smoothness of its integration are crucial to improving work efficiency. Wilson & Daugherty [9], from the employee perspective, point out that the familiarity and acceptance of AI technology by employees, as well as the opportunity to receive corresponding training, are key factors affecting the efficiency of human-machine collaboration. Jarrahi [10] from the data perspective notes that high-quality, accurate, and accessible data are the basis for effective operation of AI technology and have a direct impact on improving work efficiency.

(2) Enhancing innovation capacity

Human-AI interaction models are widely believed to enhance the innovation capabilities of employees and enterprises. The basic logic is by combining human creative thinking

and machines' efficient data processing abilities to solve complex problems and create new value. Wilson et al. [9] have studied from the perspective of complementary capabilities and noted that human-machine collaboration allows humans and machines to each play to their strengths, with humans focusing on creative thinking, emotional intelligence, and complex decision-making, while AI handles big data analysis, pattern recognition, and repetitive tasks. From the perspective of accelerating the innovation process, Davenport & Ronanki [6] believe AI can quickly process and analyze large amounts of data, providing instant insights for humans, and helping to more quickly identify innovation opportunities and test new ideas. From the perspective of learning and knowledge sharing, Brynjolfsson & Mitchell [11] propose that AI systems can serve as knowledge bases, supporting employees in learning and acquiring new skills, while also promoting cross-departmental and interdisciplinary knowledge sharing, inspiring innovative thinking. Successfully achieving human-machine collaborative innovation depends on certain key situational factors, such as, Bughin et al. [12] point out, organizational culture that encourages innovation, experimentation, and risk-taking is crucial to the success of human-AI interaction, leaders need to support technology integration, and promote an open and collaborative work environment. Kaplan & Haenlein [13] believe that the design and implementation of AI systems need to consider user-friendliness and technological adaptability to ensure that employees can effectively interact with them. Ford [14] focuses on employee skills and mindset factors, noting that employees' attitudes and acceptance of AI technology, as well as their skills and adaptability, are key factors affecting the success of human-machine collaboration, lifelong learning and skill updating are crucial to fully leveraging the innovation opportunities brought by AI.

(3) Improving decision quality

The human-AI interaction model in decision-making combines human intuition, experience, and creativity with AI's data processing capabilities, algorithm analysis, and pattern recognition, aiming to make decisions more accurate and efficient. Davenport & Ronanki [6] from a big data-driven perspective point out that AI can process and analyze large amounts of complex data, providing data-based insights and predictions, thereby helping decision-makers understand various potential outcomes and risks. From the perspective of decision speed, Bughin et al. [12] state that by automating the analysis process, AI can quickly provide decision support information, reducing the time needed for decision-making, and enabling enterprises to rapidly respond to market changes. From the angle of avoiding bias, Cowgill & Tucker [15] believe that AI systems can avoid human inherent biases and emotional impacts when analyzing data and providing suggestions, which helps make more objective decisions. The improvement in decision quality is significantly influenced by certain factors such as data quality and completeness [13],

system transparency and explainability [16], and the collaborative working and communication mechanisms between humans and AI [10].

(4) Optimizing resource allocation

Utilizing AI's data analysis and predictive capabilities helps organizational managers optimize the allocation of limited resources, thus enhancing resource utilization and organizational flexibility. Scholars have explained the mechanisms of this synergistic effect; for example, from a data-driven perspective, Davenport & Ronanki [6] point out that AI can optimize resource allocation by analyzing historical data, real-time data, and predictive models to ensure that resources are used where they are most needed. From the perspective of eliminating waste and improving utilization rates, Bughin et al. [12] believe that through predictive analysis and pattern recognition, AI can help identify areas of resource waste and propose improvement measures, thus enhancing resource utilization. Jarrahi [10] introduces a dynamic adjustment mechanism, noting that AI systems can adjust resource allocation in real time according to market demands and internal conditions, allowing organizations to flexibly respond to changes. However, achieving this goal requires high-quality data, good technical integration, and a proactive organizational culture and employee acceptance [7]. This means that to maximize the potential of human-machine collaboration in optimizing resource allocation, organizations need to invest in relevant technology, data management, and employee training and cultural development.

2.2. Perspective from a personal user

Artificial intelligence applications at the personal user level have become extremely widespread, penetrating various aspects of daily life, from enhancing personal productivity to entertainment, health monitoring, and personalized learning. Typical application scenarios include smart assistants and voice recognition, personalized recommendation systems, health monitoring and fitness apps, automatic translation and language learning, smart photography and image editing, security and privacy protection, smart home control, transportation and navigation, among others.

(1) Enhancing personal productivity and work efficiency

AI can automate a large number of repetitive and time-consuming tasks such as data entry, scheduling, and email filtering, thereby freeing up human resources to focus on higher-value work. Individuals can utilize machine learning and big data analysis, where AI can extract valuable insights from large datasets, helping individuals make wiser decisions and optimize work strategies. Additionally, AI technology can enhance communication between individuals and teams; by using AI-assisted communication tools and collaboration platforms, it can improve communication efficiency between teams and

simplify the collaboration process, making remote work and project management more efficient. Of course, the premise for efficiency improvements is the adaptability of skills and knowledge, as Brynjolfsson & McAfee [17] have pointed out—the ability of users to benefit from human-machine collaboration also depends on their capacity and desire to adapt to new technologies, including learning how to effectively use AI tools and platforms.

(2) Receiving personalized services

AI systems, by collecting and analyzing vast amounts of user data (including historical behaviors, preferences, social interactions, etc.), understand each user's unique needs and interests. This data-driven smart approach achieves highly personalized services, combined with AI's natural language processing capabilities, providing users with natural and personalized interaction experiences. Currently, typical applications include recommendation systems and health monitoring. AI-based recommendation systems can provide personalized services and recommendations based on user preferences and behavior, thereby improving the user experience [13]. In health monitoring, robotic applications have been particularly effective, especially in accompanying children with autism or the elderly. AI technology enables robots to offer social interaction, help manage daily tasks, and even perform basic health monitoring and reminders; for children with autism, specially designed AI robots can help them learn social and communication skills through games and activities, with more significant treatment effects than interpersonal relationships.

(3) Enhancing learning and development

Artificial intelligence technology provides individuals with rich learning resources and educational pathways. Utilizing AI technology, especially through smart voice assistants and translation tools, can help non-native speakers access and understand educational content, improving the global accessibility of educational resources [18]. AI-driven interactive learning tools and educational games can enhance student engagement and motivation. These tools use gamed learning, challenges, and reward systems to motivate students while providing educational content [19]. AI-assisted learning tools can offer customized learning resources based on users' progress and needs, promoting the development of individual skills and knowledge [7]. AI systems can implement adaptive testing, dynamically adjusting the difficulty level based on student responses to more accurately assess their knowledge levels and learning needs. This method helps provide more precise learning feedback and achievement assessments [20]. AI-based intelligent tutoring systems (also known as smart coaches or personalized learning systems) can offer immediate feedback and support, helping student’s master specific skills or knowledge points. These systems provide guidance in the way that best suits the student's learning

style, simulating a one-on-one teaching experience [21].

3. Negative effects of human-AI interaction

3.1. Perspective from organization

Organizations are collections of people organically formed around strategic goals, and the realization of these goals and the growth of the organization depend on the efficient work and continuous innovation of employees and teams. However, as the application scenarios of AI technology in organizations continue to increase and are deployed, the psychological state and work patterns of employees are changing, including some negative manifestations.

(1) AI fear and job instability

Currently, organizations are rapidly advancing and deploying artificial intelligence systems to manage employees. However, Lionel et al. [22] point out that artificial intelligence systems lead to reduced workloads for workers due to unemployment concerns, and thereby negatively impact organizational stability. Autor's [23] empirical study shows that the rapid development of AI and automation technology has led to the disappearance of many traditional jobs, especially those with high repetitiveness, such as in manufacturing and data entry fields, which not only results in job losses but also makes some skills obsolete. Yin et al. [24] used experimental methods to verify the double-edged sword effect of AI on the psychological health and innovative behavior of employees within organizations, noting that although artificial intelligence can improve employees' innovative behavior, there is evidence that AI can negatively impact employees' psychological health, especially when AI applications are pushed forward in organizations with low readiness for intelligent systems, significantly triggering fears and concerns about AI replacing human jobs, thereby damaging employees' normal emotional, cognitive, and innovative levels.

(2) Decision bias leading to job dissatisfaction

AI systems may solidify or amplify human biases, leading to algorithmic discrimination issues, and affecting the fairness and transparency of decision-making. The causes are complex and multidimensional, involving algorithm design, biased data, and human subjective judgment, among other aspects. Algorithmic design bias [25] refers to the idea that even if a dataset is neutral, the way the algorithm is designed may lead to discriminatory outputs, typically related to the choice of algorithmic models, the allocation of feature weights, and the setting of optimization goals. Barocas & Selbst [26] from an algorithm design perspective point out that AI systems in the decision-making process may reflect the biases of those who developed them, and coupled with the "black box" nature

of AI algorithms, make the decision-making process lack transparency and explainability. Data bias occurs when the dataset used to train AI systems already reflects certain biases, such as those based on gender, race, age, or socioeconomic status, usually stemming from unfairness in the data collection, selection, and processing processes. Human subjectivity is another factor; algorithm designers and human decision-makers in human-machine collaboration may introduce their subjective biases (unconsciously or consciously) into the machine decision-making process, especially when interpreting the advice or results provided by AI [27]. Applying such biased intelligent decision-making algorithms in organizational management can lead to serious consequences such as employee dissatisfaction. For example, Lionel et al. [22] found that from an employee perspective, artificial intelligence systems are questioned for being unfair to workers and are significantly positively correlated with increased job turnover rates, thereby reducing organizational stability.

(3) Undermining employees' innovative thinking and capabilities

The reasons and mechanisms are multifaceted, involving the marginalization of human decision-making, the reduction of creative thinking, and overreliance on technology, among other aspects. First, the widespread use of AI could lead to a reduction in human participation in innovation and weaken creative thinking, as scholars have pointed out: Over-reliance on AI might lead to a reduction in the application of human intuition and creative thinking in decision-making processes. Human intuition often provides unique insights when dealing with complex issues and exploring unknown fields, which is currently difficult for AI to replicate. However, as AI applications enhance, human decision-making in key issues becomes marginalized, which could lead to a stagnation in creative thinking. Second, from the perspective of homogenization in technical decision-making, scholars note: If organizations over-rely on specific AI systems for decision support, it could lead to a homogenization of the decision-making process, reducing the generation of innovative ideas; moreover, AI algorithms typically make predictions and recommendations based on historical data, which might also limit the exploration of novel solutions. Third, from the perspective of suppressing learning and adaptability, scholars point out that over-reliance on AI might also suppress the learning motivation and adaptability within the organization, i.e., when employees become accustomed to relying on AI-provided solutions, they may reduce their tendency to learn new skills and adapt to changes actively.

3.2. Perspective from personal user

In the process of human-AI interaction, there may be threats and negative impacts on personal interests and sustainable development, mainly due to the inherent risks associated

with AI systems and robotic technologies in processing, storing, analyzing, and using personal data, as well as changes to personal psychological cognition and behavioral habits.

(1) Privacy and data security

As AI becomes increasingly prevalent in personal life, such as in smart homes and online shopping recommendations, issues of personal data privacy and security become particularly prominent. AI systems collect vast amounts of personal data through sensors, cameras, and online interactions, including behavioral data, location information, and personal preferences. Opaque data processing procedures and inappropriate data protection measures can lead to privacy breaches. Furthermore, the large amounts of personal data collected and analyzed by AI systems, if not adequately protected—such as risks of hacking, unauthorized access, and internal misuse during data transmission, storage, and processing—can also lead to data breaches and privacy violations [28].

(2) Social isolation and interpersonal conflicts

The proliferation of AI and digital technology might lead to an overreliance on technology, reducing face-to-face social interactions, and thereby affecting interpersonal relationships and social cohesion [29]. Many scholars have empirically tested this and found that overdependence on AI and digital devices can impact the development of interpersonal communication abilities and social skills, especially among children and teenagers.

(3) Job crisis and unemployment

The development of AI and automation technology may lead to the reduction of job positions in specific professions, causing instability in the employment market and a decline in job security. Another pathway to a job crisis is the reduced adaptability caused by an overreliance on AI. Research by scholars shows that overreliance on AI technology can decrease an individual's problem-solving abilities and adaptability, weakening their capacity to face unknown challenges, and thus preventing them from adapting to changes in job content and career turbulence.

4. Conclusion

Important research findings in the field of human-AI interaction indicate that the efficiency of human-AI interaction is higher than that of human-only efforts and that effective interaction can enhance human cognitive abilities. By integrating human cognitive capabilities with the machine's information processing power, human-AI interaction can help humans better understand and handle complex information, thus enhancing cognitive abilities. However, human-AI interaction needs to focus on human needs and experiences, including psychological and behavioral characteristics, and cognitive and perceptual

patterns. Only when human-AI interaction fully considers human needs and experiences can better collaborative effects be achieved. Moreover, establishing trust is essential for positive outcomes; effective and reliable human-AI interaction can only occur when humans trust the AI systems they interact with.

Despite the achievements of human-AI interaction, it still faces several challenges and issues. Future research needs to focus on important topics, strengthen interdisciplinary research, incorporate ideas from psychology, sociology, behavioral sciences, and try diverse research methods, particularly experimental and empirical scientific methods.

First, strategies for eliminating cognitive biases in AI systems are crucial, as human cognitive biases towards AI systems can hinder the development of human-AI interaction. Therefore, future research needs to explore how to eliminate these biases to enhance human trust and acceptance of AI systems.

Second, improving the transparency of AI system decision-making is necessary, as the opacity of the decision-making processes in AI systems makes it difficult for users to understand and trust their workings, which in turn affects the generation of positive collaborative effects. Future research should focus on how to enhance the transparency and explainability of AI system decisions.

Third, the ethical and legal responsibilities of AI systems need attention, as with the widespread application of AI technology across various fields, its ethical and legal responsibilities have become increasingly prominent. To ensure that technology truly serves the sustainable development of human society, future research must explore how to clarify the legal status and responsibility of AI systems, ensuring that their applications meet ethical and legal standards.

Fourth, optimizing the collaboration mechanisms between AI and humans is necessary. Although some success has been achieved in human-machine collaboration, how to further optimize the mechanisms of collaboration between humans and AI systems still faces many challenges. Future research needs to focus on how to better leverage the advantages of human-machine collaboration to better serve human progress and societal development.

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