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Evaluating the Psychological Impact of AI-Driven Decision Support Systems: A Critical Assessment of the PAAI Framework——Implications for Human-Centered Design and Organizational Implementation

Qiaochu Fu[1,2], Yue Ma[1]*

[1]Huizhou University, Huizhou 516007, Guangdong, China

[2]Beijing Normal - Hong Kong Baptist University, Zhuhai 519087, Guangdong, China

**Author to whom correspondence should be addressed.*

Abstract: The article:"Psychological Assessment of AI-Based Decision Support Systems: Tool Development and Expected Benefits" proposes a new tool, which is PAAI. It can be used to assess the impact of AI-based decision support systems on users' psychological load. The aim of this research is to provide an assessment technique that places people in key positions for AI-driven decision support systems in certain professional environments. And it is also necessary to evaluate the role that this tool can play. This commentary will examine the main findings, research methods and actual implications in the article, and also offer some recommendations for further studies.

Keywords: PAAI;AI-based Decision Support Systems; Psychological Impact

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1. Introduction

Against the backdrop of accelerating digitalization and globalization, professionals across various industries are confronted with increasingly complex decision-making scenarios. The explosive growth of massive data has exceeded human information processing capabilities, and coupled with the superimposition of stressors such as time pressure and performance requirements, it has led to rising uncertainty and stress in the decision-making process, thereby affecting decision quality, job satisfaction, and organizational productivity[1]. In this context, artificial intelligence (AI)-based decision support systems (DSSs) have emerged as important tools for assisting human decision-making and achieving human-machine collaboration, leveraging their powerful algorithmic advantages to take over complex tasks such as big data processing. Such systems are regarded as the core carrier of augmented intelligence, aiming to enhance decision-making efficiency through the complementary advantages of humans and machines rather than replacing human dominance, creating a win-win situation for professionals and enterprises[2].

However, the implementation effects of many AI projects have not met expectations, with frequent problems such

as technical flaws, improper organizational management, and unreasonable system design[3]. More critically, existing evaluation tools have obvious limitations: they either only focus on the single impact of system attributes on user experience or merely pay attention to the macro effect of technology on overall task design, lacking a comprehensive evaluation framework that integrates user experience and job analysis[4]. At the same time, the introduction of AI systems may trigger unintended negative impacts, such as impaired user perceived competence and reduced job security, which further highlights the necessity of comprehensive evaluation[5].

In 2019, the International Organization for Standardization (ISO) advocated the adoption of a human-centered design approach in the development of interactive systems, emphasizing attention to user needs and psychological load, and preventing negative effects brought by technology[6]. This concept provides a direction for solving the above problems, but in practice, there is a lack of exclusive evaluation tools adapted to AI-based DSSs. Therefore, developing an evaluation tool that starts from a human perspective, considers system characteristics, task attributes, and work scenarios, and can comprehensively capture the impact of AI-based DSSs on users' psychological load has become an important issue urgently needing to be solved. It fills the gap in existing research and provides a scientific basis for technical optimization and organizational decision-making.

2. Literature overview

The main purpose of this study is to develop a method and verify it. This method can evaluate the usage of artificial intelligence decision assistance systems in real environments. It also emphasizes the impact of these systems on users' psychological burden. What PAAI technology aims to assess is the impact of these innovations on users' psychological burden. The multiple aspects of psychological overload include stress, job satisfaction and task performance. Researchers have offered suggestions, hoping to adopt a people-oriented design approach to enable artificial intelligence systems to alleviate users' stress, enhance work performance, and avoid negative impacts. The PAAI tool was verified through two independent surveys and its effectiveness through confirmatory factor analysis, and finally obtained good fitting indicators. This proves that it has the ability to assess mental workload.

With its powerful data processing and analysis capabilities, AI-assisted decision-making tools have become the core tools for optimizing decision-making processes in various industries, and its multi-dimensional impact on human psychology has also become the focus of academic research. Relevant research focuses on tool characteristics, task scenarios and occupational environment, and reveals its complex mechanism of action on user psychology.

At the level of instant interaction, the characteristics of tool design directly affect the user's psychological experience. The technology acceptance model proposed by Davis (1989) lays the foundation for research in this field. Its core constructs, perceived usefulness and ease of use, have been proved to significantly improve user trust and satisfaction, and reduce negative emotions such as irritability[7]. Buschmeyer et al. (2023) further expanded the research and pointed out that the perceived comprehensibility and usability of AI tools are equally critical-interpretable design can alleviate the "black box"anxiety, while the lack of system stability will directly lead to user pressure[8]. Arrieta et al. (2020) emphasized that increasing the transparency of tools through interpretable AI technology can effectively enhance user trust and reduce the cognitive burden in the decision-making process[9].

At the task processing level, the tool indirectly affects the user 's psychology by changing the task characteristics. Meske and Bunde (2022) found that well-designed AI tools can reduce task complexity and information overload pressure, and improve decision-making efficiency and sense of achievement[10]. However, the case study of Mayer et al. shows that excessive automation may lead to users' insufficient perception of challenges, boredom, and even skill degradation anxiety. At the same time, the tool 's change in the need for collaborative communication is two-sided: it may alleviate the pressure of high-load communication, or it may cause negative emotions due to reduced social interaction.

At the career development level, perceived job insecurity has emerged as a prominent psychological risk. Studies by Gimpel et al. (2020) and Lingmont & Alexiou (2020) both indicate that the widespread application of AI technology has

led some users to worry about job replacement or insufficient digital competence, and such anxiety significantly reduces job satisfaction[11, 12]. Wilkens (2020) further points out that the double-edged sword effect of AI in the workplace is reflected in the fact that while it can improve productivity, it may exert long-term negative impacts on users' mental health by restricting autonomous decision-making space and undermining the sense of career growth[13].

In addition, some studies have focused on psychological impacts in specific scenarios. Haefner et al. (2021) found that the application of AI in the field of mental health can assist in diagnosis but may also trigger users' concerns about privacy leakage[14]; meanwhile, research by Ahmad et al. (2023) suggests that over-reliance on AI may lead to human decision-making inertia and the degradation of critical thinking[15].

Overall, existing literature confirms that the impact of AI-assisted decision-making tools on human psychology encompasses both positive and negative dimensions, and their effectiveness depends on the degree of alignment between tool design, task characteristics, and individual user differences. Future research should further focus on cross-cultural scenarios and long-term psychological effects to provide more comprehensive theoretical support and practical guidance for achieving a win-win situation between technological value and users' psychological well-being.

3. Research methods and tools evaluation

The main advantage of this study lies in that the research method adopted is very rigorous. To verify its effectiveness, the PAAI tool will rely on the analysis of projects and scales, and also conduct exploratory factor analysis, namely EFA, as well as confirmatory factor analysis, namely CFA.. The study used a larger sample size (the first study N = 223, the second study N = 471), thereby ensuring the effectiveness and reliability of the statistics. In addition, the researchers also tested the convergent validity and discriminant validity of the tool to ensure that it can not only accurately measure psychological load but also be associated with existing validated tools. However, despite the solid research design, there are still some areas that can be improved. For example, the study focuses on individuals using AI decision support systems, which may limit the generalizability of the research results. Future research can include more professional backgrounds and industries to assess whether the tool is suitable for different professional environments. Moreover, although the tool measures multiple key psychological load aspects such as stress and work performance,(Davis, 1989)[7] it can further explore the long-term psychological impact of using AI systems, particularly the effects related to professional security, such as the professional insecurity mentioned in the article.

4. The contributions and impacts of the research

This research has made significant contributions to the fields of psychological assessment and artificial intelligence. The PAAI tool fills the gap in the current assessment of AI decision support system usage by neglecting the psychological load, providing a comprehensive framework for evaluating the impact of AI on employee psychological load. The research emphasises the human-centered design philosophy, proposing that AI systems need help to ease users' psychological load to improve work efficiency and diminish stress. This approach is especially significant in the contemporary, fast-paced, high-data-volume industrial environment. The article illustrates the possible advantages of AI decision support systems, including the mitigation of user load through the simplification of decision-making and the reduction of information overload, therefore enhancing work performance and reducing stress. This is particularly crucial for contemporary professionals confronted with a vast amount of data and information. The research indicates that AI need be used as an instrument for human decision-making instead of a replacement, to establish an efficient "human-machine collaboration" model.

5. Practical significance

The practical significance of this research is considerable. The continuous development of AI technology makes its application in the workplace unavoidable. Understanding the psychological effects of these technologies is essential for their successful implementation. The PAAI tools enable organizations to evaluate the influence of AI systems on employee psychological workload, facilitating early detection of negative impacts and later correction. If an AI system increases user stress or induces professional uncertainty, organizations may reduce these issues by modifying system design or offering alternative training and support. This proactive approach could reduce the risk of AI deployment failure, as mentioned in the article, where users may be unwilling to use the system due to its deficiency in transparency or practicality (Meske & Bunde, 2022)[10].

6. Criticism and suggestions

Although the article offers useful insights, some aspects remain available for additional exploration. The research primarily examines the immediate psychological effects of using AI decision-support systems. Future study might investigate the long-term impacts of AI system usage, particularly on professional identity, career advancement, and general job satisfaction. Knowing these long-lasting consequences can offer a more thorough viewpoint on the use of AI in the workplace. Secondly, despite the tool emphasising user experience and task analysis, both important components, it may also be broadened to evaluate organisational culture and inter-task attributes. Organizational culture and cross-task variables may have a very significant impact on the extent to which employees use and accept artificial intelligence technology. The use of artificial intelligence may lead to changes in the internal culture of the organization, including changes in work relationships or changes in hierarchical dynamics, and these changes may not be well reflected with the existing tools. With the rapid development of artificial intelligence technology, the PAAI tool needs to be constantly upgraded in order to keep up with the pace of new technology development. Future revised versions of this tool may add some new system functions and some psychological factors to ensure its relevance and effectiveness.

7. Conclusion

Overall, this paper has, to a certain extent, enhanced everyone's understanding of the impact of artificial intelligence on the psychological workload of employees in the workplace. The PAAI tool provides a relatively effective framework for evaluating AI-driven decision support systems, enabling the application of technology to workers' labor. Although the methods and findings of this research are relatively reliable, However, investigations are still needed on the long-term impact of the use of artificial intelligence and the continuous changes in organizational culture. As artificial intelligence continues to have an impact on future work, tools like PAAI will play a crucial role in ensuring that these technologies enhance employees' well-being and job performance.

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Disclosure statement

The author declares no conflict of interest.

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