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Substitution Boundaries of AI Agents in Team Collaboration: An Empirical Analysis Based on Front-Line Employees' Perceptions

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Abstract. With AI agents increasingly involved in teamwork, whether AI can substitute human collaboration has become a heated topic in academia. Large-model-driven agents are now capable of participating in team brainstorming, task coordination, and collaborative problem-solving, and knowledge-intensive industries are beginning to form a large number of human-machine hybrid teams. Existing research mostly relies on theoretical reasoning and lacks empirical perceptual data from front-line practitioners. Drawing on a questionnaire survey of 158 employees with cross-industry teamwork experience, this paper explores practitioners' perceptions regarding the substitution of human collaborative behaviors by AI. The results show that AI can only partially substitute procedural and rule-oriented collaborative tasks, whereas social-emotional communication, conflict mediation and value judgment remain irreplaceable human strengths. Position, work experience and AI familiarity jointly shape individual perceptions of the substitution boundary. Most practitioners regard AI as an auxiliary tool rather than a leader of team collaboration. This study provides a practical reference for enterprises applying AI collaboration tools.

Keywords: AI Agent, Human Collaboration, Human-AI Collaboration

1. Introduction

Many scholars have conducted extensive discussions on whether AI agents can substitute human collaboration. Human collaboration refers to an interactive process that occurs purely between people and relies on reconciling interests, aligning roles, and handling social relationships within a team. Artificial intelligence is a goal-oriented system capable of perceiving environmental information, reasoning and planning multi-step tasks, invoking external tools, executing actions, and adjusting its behavior according to feedback to accomplish a given goal. Su Jianwei proposed that machines can never replace human negentropy capability: humans are explorers while AI is the doer [1]. Tang Chao also pointed out that AI possesses efficient information-processing capabilities but cannot define the priority goals of an organization, weigh conflicting values, or bear the ultimate ethical and organizational responsibility for collective decisions [2]. From the perspective of work psychology, Peng Zhen et al. argued that although AI is reshaping modern-day work contexts, authentic human-to-human collaboration consists of intra-group competition and strategic

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interaction, empathetic negotiation, and the maintenance of interpersonal ties. These subtle social dynamics cannot readily be reproduced by algorithm-driven systems [3].

However, the above studies mainly rely on theoretical reasoning, literature review and qualitative case analysis to construct rich conceptual frameworks and discuss the theoretical boundaries of AI-agent substitution. A research gap remains: none of them has used questionnaire-based empirical methods to systematically collect real perceptual data from front-line practitioners, which leaves the research somewhat lacking in credibility and authenticity. By adopting questionnaire empirical analysis combined with chart analysis, this study enables a broad public with real work experience to participate and obtains true and credible survey results. On the basis of existing theory, this paper proposes a core research hypothesis: AI agents can partially substitute the procedural and rule-oriented components of human collaboration, but cannot fully substitute human collaboration, especially the components involving social emotion, conflict mediation and value judgment.

2. Questionnaire design and procedure

The entire questionnaire procedure is as follows. First, the sample scope requires respondents to be employed workers aged 22-65 with team and organizational coordination experience across multiple industries, including front-line employees, managers, and administrative coordinators. The questionnaire is divided into four main sections plus one open-ended question. The first section comprises multiple-choice questions covering respondents' gender, job position, income, age, organizational tenure, and educational background. This section is designed to yield a general overview of the research sample. The second section explores respondents' acceptance of AI involvement in human work. These items are presented as five-point Likert scales (1 = strongly disagree to 5 = strongly agree), plus two multiple-choice questions that ask respondents to select, from the provided employment directions, which jobs can and cannot be replaced by AI. This section effectively reveals the public's perceived boundary of AI substitution and allows the underlying reasons to be analyzed by industry type.

The third and fourth sections are similar in type: they respectively present common advantages and drawbacks of AI collected from multiple platforms and ask respondents to rate their agreement on five-point Likert scales. These two sections mainly explore the outstanding advantages of AI in team collaboration as experienced by people with real work experience, as well as the defects and various hidden risks of AI. The last section is an open-ended question that invites participants to freely propose how to balance AI and human collaboration. This gives them ample room to express real thoughts not covered by the multiple-choice items, and the system has automatically tabulated the option proportions for each question.

3. Research results

3.1. Distribution of attitudes by demographic characteristics

Table 1. Distribution of attitudes

Group Category	Group Details	Percentage agreeing AI can partially replace human collaboration	Percentage believing socio-emotional collaboration cannot be replaced by AI
Gender	Male	58.2%	—

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Table 1. (continued)

	Female	41.7%	68.3%
Job Position	Junior-level & operational staff	67.4%	—
	Administrative & general coordination staff	51.9%	—
	Middle-level managers & HR coordinators	—	82.6%
Age & Working Years	18-30 years old	62.5%	—
	Working experience ≥ 5 years	—	76.9%
Education & Income	Bachelor's degree or above	55.0%	—
	Low-income & short-tenure (agree with full AI replacement)	28.7%	—
	High-income management group (agree with full AI replacement)	7.4%	—
AI Usage Experience	Weekly AI users	73.1%	—
	Never use AI tools	—	78.4%

The results are organized in tables for a more intuitive and clear presentation. Table 1 records the distribution of participants' attitudes toward AI substituting human collaboration across different characteristics (gender, position, income, age, tenure, education, and AI usage experience). It clearly reflects the factors that lead people to hold different answers to whether AI can substitute human collaboration. The research results are as follows. In terms of gender differences among survey participants, 58.2% of male respondents held the view that AI could partially substitute human collaboration, compared with only 41.7% of female respondents. A large proportion of female respondents (68.3%) maintained that core human collaboration centred on emotional communication and trust-building is irreplaceable by AI. This indicates that female respondents place greater value on the social-emotional attributes behind human collaboration, while male respondents focus more on work efficiency and the optimization of standardized tasks.

Regarding position differences, front-line and operations employees showed the highest acceptance of AI substitution, with 67.4% agreeing that AI can replace repetitive and process-oriented collaborative work. Administrative and general coordination staff held a relatively neutral attitude, with 51.9% supporting partial substitution. However, 82.6% of mid-level managers and personnel-coordination staff believed that AI cannot substitute human collaboration. The main reason is that mediating organizational conflicts, facilitating emotional communication within teams, and making judgments based on tacit knowledge rely entirely on human subjective perception and long-term workplace experience. Such highly ambiguous organizational work scenarios are difficult to handle using algorithms alone, and this is precisely where the irreplaceable value of humans lies in human-machine collaboration [4].

Regarding age and tenure, young respondents aged 18-30 showed higher acceptance of AI substitution, with 62.5% believing that AI can assist in or even replace most basic collaborative work. In contrast, employees with more than five years of tenure were highly conservative, with

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76.9% believing that human collaboration cannot be replaced. Through years of work experience, seasoned employees have come to realize that many collaborative situations in real-world organizations are ambiguous and lack clear rules, requiring flexible handling based on human intuition and situational awareness—capabilities that artificial intelligence does not yet possess [5].

When analysing differences across educational backgrounds and income brackets, respondents holding a bachelor's degree or higher exhibited relatively moderate attitudes. Around 55 % of this group accepted partial AI substitution for human collaboration but ruled out the possibility of total replacement. Low-income participants with brief organizational tenure showed a greater tendency to perceive AI as capable of fully replacing human work (28.7 %). By comparison, few respondents from the high-income management cohort supported total substitution, with merely 7.4 % agreeing with this statement. Regarding AI usage experience, group differences are the most prominent. Among respondents who use AI tools every week, 73.1% recognized the substitution value of AI in standardized collaborative tasks. By contrast, among respondents who never use AI tools, 78.4% believed that AI cannot substitute human collaboration at all. These findings demonstrate that an individual's familiarity with AI technology significantly influences their assessment of the limits of AI substitution, and that different individuals develop varying perceptions and attitudes toward AI after encountering it in work settings [6].

3.2. Overall attitudes and judgments on replaceable positions

Table 2. Overall attitudes and judgments on replaceable positions

Survey Item	Option	Percentage
Overall substitution level of AI for human collaboration	AI can fully replace human collaboration	8.9%
	AI can only partially replace human collaboration	65.2%
	AI cannot replace human collaboration at all	25.9%
Collaborative tasks regarded as replaceable by AI	Routine scheduling, document circulation, meeting minutes, information notification, standardized administrative approval	71.4%
Most recognized replaceable job roles	Administrative assistant, schedule manager, data coordinator, routine process administrator	—

Table 2 records participants' overall attitudes toward AI substituting human collaboration and their judgments on career directions, which reveals the public's mainstream view on this research question and the underlying reasons. The table shows that only 8.9% of respondents believed that AI can completely substitute human collaboration; 65.2% held the mainstream view that AI can only partially substitute human collaboration; and 25.9% believed that AI cannot substitute human collaboration at all. This statistical result strongly demonstrates that the public's attitude toward AI substitution is partial substitution only and that humans still control the core work.

When further broken down into the types of work that AI can and cannot replace, the data show that 71.4% of respondents believed that routine scheduling, document flow, meeting minutes, information notification and standardized administrative approval can be completed by AI. The most recognized replaceable positions include administrative assistant, schedule manager, data coordinator and routine process manager. The common feature of such jobs exactly matches the characteristics of AI-replaceable work mentioned above.

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3.3. Dependence on AI collaboration tools

Table 3. Result of dependence on AI collaboration tools

Dependency Level	Behavior Description	Percentage
High dependency	Allow AI to dominate team collaborative work	11.4%
Moderate dependency	Frequently use AI for scheduling, text sorting, meeting minutes and other auxiliary tasks; core communication and conflict resolution handled by humans	43.0%
Low dependency	Use AI occasionally; no fixed working routine	28.5%
No dependency	Never use AI tools in collaborative work scenarios	17.1%

Table 3 reflects the public's dependence on AI collaboration tools and demonstrates the importance of AI in daily life and work. The data show that only 11.4% of respondents were highly dependent on AI collaboration tools, indicating that very few employees currently let AI lead team collaboration. 43.0% were moderately dependent: they frequently use AI to complete auxiliary standardized collaboration tasks such as automatic scheduling, text organization and meeting minutes, while core communication and conflict handling still rely entirely on humans. This is also the most common human-AI collaboration model in today's workplace. 28.5% were mildly dependent, using AI occasionally without a fixed habit. Therefore, it can be concluded that AI has become a common auxiliary collaboration tool in modern work but has not yet become the dominant substitute for human collaboration. Most people still maintain a rational boundary, following a model in which AI undertakes mechanical process work while humans control the core communication and relationship coordination within the organization [7].

4. Hypothesis verification

Based on the statistical results of 158 questionnaire samples, the hypothesis received overall support from the data. In terms of the overall sample attitude, only 8.9% of respondents believed that AI can completely substitute human collaboration, 65.2% endorsed partial substitution, and 25.9% believed that AI cannot substitute human collaboration at all. This indicates that the mainstream cognition of workplace practitioners does not support AI agents fully taking over collaborative activities between people. From the data on replaceable task types, 71.4% of respondents believed that collaborative matters with clear rules and high repetition, such as scheduling, document flow, meeting minutes and standardized approval, can be handed over to AI. This successfully confirms the first half of the hypothesis: AI can substitute procedural and standardized collaborative tasks.

At the same time, 82.6% of mid-level managers and personnel-coordination staff stated that human collaboration cannot be replaced by AI, because their work heavily involves conflict mediation, team emotional maintenance and tacit-experience judgment; 68.3% of the female group believed that AI cannot complete collaboration that relies on trust building and emotional communication. In addition, in the AI-tool dependence statistics, only 11.4% of respondents were highly dependent on AI collaboration tools, while the largest proportion (43.0%) of the moderately dependent group used AI only for auxiliary matters such as scheduling and minutes. Conflict handling and core interpersonal communication still retain a complete human-processing link. Collectively, the survey results support the view that AI is suited for standardized procedural collaborative work while human strengths remain irreplaceable in emotion-laden interpersonal cooperation [8-10].

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5. Conclusion

Focusing on the question of whether artificial intelligence is capable of substituting human collaboration, this paper draws upon questionnaire responses from 158 employees with practical team-coordination experience spanning diverse industries, alongside prior scholarly work, and arrives at three central conclusions:

1. AI agents can only partially substitute human collaboration and cannot achieve complete substitution.

2. In the current real-world workplace, the dominant model is AI as an auxiliary tool with humans holding the core of collaboration. The human-AI relationship manifests more as enhancement and assistance rather than AI replacing human collaboration participants.

3. An individual's perception of the boundary of AI substitution is jointly influenced by job authority and responsibility, workplace work experience, and familiarity with AI technology.

This study also has limitations. First, all collected data are respondents' subjective attitudes and views rather than the objective performance observed in real experiments where AI and human groups complete collaborative tasks; subjective cognition may be biased. Second, the total sample size is only 158, which is limited in scale. As the questionnaire was distributed online via Questionnaire Star (Wenjuanxing), there is online sampling bias: some industries and positions are unevenly represented, and not all occupations can be included. Future research should conduct controlled experiments to compensate for the shortcomings of subjective questionnaires and increase the credibility of the study.

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