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# Artificial Intelligence Agents as Team Leaders: a Study of the Impact on Team Climate and Team Effectiveness

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# Artificial Intelligence Agents as Team Leaders : A study of the impact on team climate and team effectiveness
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**ABSTRACT**

With the rise and application of artificial intelligence ( AI ), organizations have begun to introduce AI technology to reduce management costs and improve the efficiency of organizational operations. The team composition of human-computer cooperation is also becoming more and more popular. However, there is limited literature on AI as a team leader, mainly focusing on AI as a team member to collaborate with human employees, or as an assistant in the team to assist human employees.This study mainly studies the influence of AI as a team leader on team atmosphere and team effectiveness, and explores the moderating effect of team leader performance. We designed two situational experiments to measure the impact on team climate and team effectiveness by manipulating team leadership types and team leadership performance. The results show that AI as a team leader will bring a better team climate than human as a team leader, and there is no significant difference in team effectiveness.

*Keywords*: Artificial intelligence, team Leader, team climate, team effectiveness.

## INTRODUCTION

In the era of digital economy, artificial intelligence (AI) is infiltrating into various fields of economic development at an extremely fast rate,becoming an important boost to promote team efficiency.Different from traditional computer systems and automation equipment, AI,with its huge database and powerful algorithm and computing power support,can interact and learn more deeply with employees,and shape a new model of human-machine collaborative office in the team (Gkinko & Elbanna, 2023).More and more AI technologies have been incorporated into team operations(Peng, van Doorn, Eggers, & Wieringa, 2022), AI agents work with human employees as team members in some teams(Harris-Watson, Larson, Lauharatanahirun, DeChurch, & Contractor, 2023),or as team assistants in some teams to assist human employees(Yin, Jiang, & Niu, 2024). Organizations have also begun to deploy artificial intelligence (AI) agents as virtual team leaders to help guide teams, assign tasks, manage information, and coordinate team processes.It is common in the gig economy, for example, for AI assistants in food delivery platforms that help merchants and delivery drivers automatically take orders and respond to messages. In the small virtual team composed of merchants, takeaway riders and AI assistants, AI serves as the leader of the virtual team, assigning order tasks and delivery tasks to merchants and takeaway riders respectively. Guide delivery routes for takeout riders and prompt merchants to reply to customer messages.However, the different roles of AI in the team may lead employees to have different views on AI and the whole team. When the virtual team leader is AI, how team members will respond to the role of AI team members as leaders or promoters, guide the team and delegate tasks to human team members requires more research.

Team climate and team effectiveness are important factors affecting team performance and innovation ability,leaders are the key drivers of team climate(Orekoya, 2024) and team effectiveness(Orekoya, 2024). However, there are still significant gaps in interdisciplinary research involving the introduction of AI into the team to assume the impact of leadership roles on the team. The study shows that inclusive leadership has a positive impact on team climate in small manufacturing firms(Orekoya, 2024).In addition, the performance of leaders is closely related to employees ' perception of the whole team(Rego, Melo, Bluhm, e Cunha, & Júnior, 2021).Therefore, this study will introduce the performance of leaders as a moderator variable, focusing on the following three issues.

Research Question 1 ( RQ1 ) : Do team members have different perceptions of the team climate led by artificial intelligence teams and the perception of the team climate led by human teams ?

Research Question 2 ( RQ2 ) : Do team members have different perceptions of team effectiveness between teams led by artificial intelligence teams and teams led by humans ?

Research Question 3 ( RQ3 ) : Compared with the good performance of human team leaders, does the good performance of artificial intelligence team leaders have a stronger or weaker impact on team climate and team effectiveness ?

## THEORETICAL BACKGROUND

### Social Information Processing Theory

Social information processing theory believes that individual activities and behaviors do not occur in a vacuum place, but are usually affected by various social information brought about by complex environments to a large extent, such as leadership behavior(Liu & Yu, 2023), job requirements(Schilbach, Baethge, & Rigotti, 2021), organizational situations(Kebede & Wang, 2022), and interpersonal relationships.Team members ' perception of team climate and team effectiveness is derived from the processing of various information obtained in the process of team work. As the core figure of team resources and power distribution, team leader 's leadership is an important factor affecting team climate perception. The process of guiding the team, assigning tasks, managing information and coordinating team processes is a key channel for employees to obtain relevant information. At the same time, team members continue to pay attention to the performance of team leaders in the process of participating in the team 's task practice. After information processing, the perception of team climate and team effectiveness is obtained.There are significant differences between humans and AI, so team leaders who are held by AI and by humans will allow human members in the team to receive different information. For example, team members will think that AI will be less selfish and will not make empty promises compared with humans, and will more effectively set team goals.

### Team Climate

Team climate refers to “an individual’s perceptions of his/her proximal work environment”(Kinnunen, Feldt, & Mauno, 2016). This study uses the following four factor models to define team climate : vision, engagement security, task orientation and support for innovation(Anderson & West, 1998).

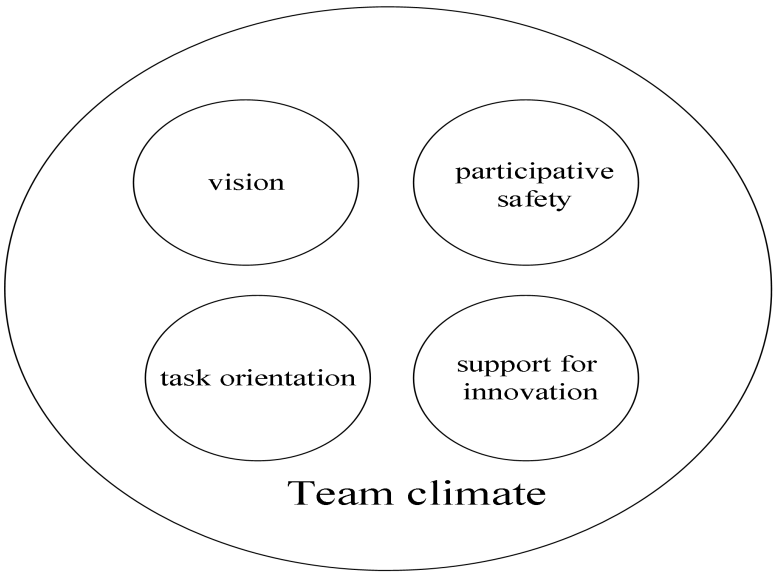
The vision is that the team has clear and achievable goals that they are concerned about.

Engagement security refers to active participation in working group relationships and interactions in a non-threatening environment.

Task orientation means that the team is fully committed to excellent task performance.

Innovation support refers to “expectations, approvals, and practical support for attempts to introduce new and improved ways of doing things in the work environment”.

Here are many factors that affect team climate. Existing research shows that leadership is closely related to team climate. Empirical research has found that inclusive leadership will enhance team members' perception of team climate(Orekoya, 2024); using innovative methods during team startup can create a better team climate(Primus & Jiang, 2019);The relationship between team safety transformational leadership and workplace safety behaviors is moderated by team safety climate(D. Wang, Mao, Zhao, Wang, & Hu, 2023a, 2023b). These findings provide a basis for this study to explore AI and human leadership Lay the foundation for the differences in team climate impact.




Source: Anderson & west(1998)
Figure 1: Four-factor model

### Team Effectiveness

Team effectiveness is a key indicator of a team's effectiveness (satisfaction and performance) and is defined as a team's collective belief in its collective ability to work effectively(Hardin, Davison, Schneider, Looney, & Sarker, 2024). It is known to increase members' confidence in their team's ability to cope with new challenges and tolerate ambiguity and

uncertainty(Elms, Gill, & Gonzalez-Morales, 2022). Team effectiveness reflects employees' general beliefs about team performance capabilities across tasks and situations, and will be affected by leadership and will in turn affect employees' work behaviors and status. Existing research shows that charismatic leadership will affect team work innovation behavior through team effectiveness(Le Blanc, González-Romá, & Wang, 2021). In addition, collaboration technology plays an important role in enhancing the effectiveness of virtual teams(Kim, Liden, Liu, & Wu, 2022).

AI assumes the role of leader in the team as a result of technological development and reflects the benefits of technological development. It must also use various technologies during its tenure as a team leader. The above findings serve as the basis for this study to explore the impact of AI and human leadership on team effectiveness. Differences in impact point the way.

## MODEL CONSTRUCTION AND RESEARCH HYPOTHESIS

### Research Hypotheses

***The impact of AI leadership and human leadership on team climate***

According to social information processing theory, employees ' perceptions of team climate and team effectiveness are largely influenced by various social information brought by complex environments(L. Wang & Wu, 2024). From the perspective of social information, team leadership is the core of team work. Leaders themselves and their behaviors will send a series of information to employees(Yang, Chen, Li, Yu, & Wang, 2023). Employees will evaluate the team atmosphere and team effectiveness according to the information received and affect their subsequent work behavior.

When employees know that team leaders are served by AI rather than human information, first of all, employees will think that AI is more direct and sincere than human beings and will not beat around the bush and make empty promises to bamboozle people(Griffith, Connelly, & Thiel, 2011). Therefore, employees will think that the team vision described by AI leaders is clearer than that of human leaders.Secondly, employees will think that AI is less likely than humans to develop their own small groups, or have opinions on one or some employees, and will not use implicit or explicit means to trap employees, so as to make things hard for them, make them stumble, and let them dare not or disloyally participate in group work relationships and interactions in an environment with hidden traps.Therefore, employees will think that the participation security of AI-led teams is higher than that of human-led teams(Chai, Ma, Wang, Zhu, & Han, 2024).In addition, employees will think that AI is less selfish than human beings, and will not deduct the rewards that should belong to employees for their own interests or take over the labor achievements that employees have worked hard to produce. Therefore, employees will think that AI-led teams are more task-oriented than human-led teams.Finally, employees will think that AI pays more attention to results than human beings, and does not care about the process of employees ' specific work completion. No matter whether employees are innovative or not in their work process, there is no difference for AI, and it will not reveal the expectations, approvals and practical support of attempts to introduce new and improved ways of doing things in the work environment. Therefore, employees will think that AI-led teams have lower innovation support than human-led teams.Overall, the team climate of AI leadership will be better than that of human leadership. Therefore, this paper proposes the following hypothesis:

Hypothesis 1a ( H1a ) : AI-led team visions will be considered more explicit than human-led.

Assumption 1b ( H1b ) : AI-led teams are considered to be more secure than human-led.

Hypothesis 1c ( H1c ) : AI-led team task orientation will be considered higher than human-led.

Hypothesis 1d ( H1d ) : AI-led team innovation support will be considered less than human-led.

Hypothesis 2 ( H2 ) : Team members have a better perception of team climate in AI-led teams than in human-led teams.

AI is considered to be more capable than humans, but lacks warmth and empathy. Therefore, AI leaders cannot use team-building activities such as dinners, games, and mountain climbing to deepen team feelings and improve team cohesion like human leaders(van der Voet & Steijn, 2021).AI will also be considered to be impersonal, focusing only on work progress, and not caring about the physical and mental health and living conditions of employees at all. When team members are subjected to external oppression and threats, human leaders are more likely to help employees than AI leaders(Islam, Ahmad, & Ahmed, 2023). In summary, team members have a higher sense of belonging to human-led teams. Therefore, this paper proposes the following hypothesis:

Hypothesis 3 ( H3 ) : Team members have a lower perception of team effectiveness in AI-led teams than in human-led teams.

***Leader performance moderates the relationship between type of team leader(AI vs. Human) on team climate and team effectiveness.***

We have theorized how AI team leaders influence the perception of team climate and team effectiveness relative to human team members under the assumption of good performance. Perception is usually influenced by leadership performance.The performance of artificial intelligence will also affect people 's cognition. Good performance is usually positively evaluated, while bad performance is negatively evaluated(Dennis, Lakhiwal, & Sachdeva, 2023).

Leaders ' performance is the obvious information of team members(Staw, DeCelles, & de Goey, 2019; Staw, Decelles, & Goey, 2019), which can affect team members ' perception of team climate and team effectiveness. According to the theory of social information processing, employees will process all kinds of complex information obtained in the workplace, so as to evaluate and judge their own environment to adjust their behavior(L. Wang & Wu, 2024).

Previous studies have shown that people are more sensitive to errors made by artificial intelligence technology than humans(Jones-Jang & Park, 2023). Similarly, users lose confidence in artificial intelligence faster than humans. This phenomenon may be because the performance of artificial intelligence is more consistent than humans(Dennis et al., 2023).Therefore, we infer that performance has a greater impact on AI team leaders ' perceptions of team climate and team effectiveness than human team leaders. Poor performance of artificial intelligence team leaders will reduce perception, while good performance will increase perception. Therefore, this paper proposes the following hypothesis:

Hypothesis 4 ( H4 ) : Leadership performance moderates the relationship between team leadership type and team climate perception and team effectiveness perception. When team leadership performance is good, this relationship will be strengthened.

**Conceptual Structure**

The conceptual model is illustrated by the following figure 2：

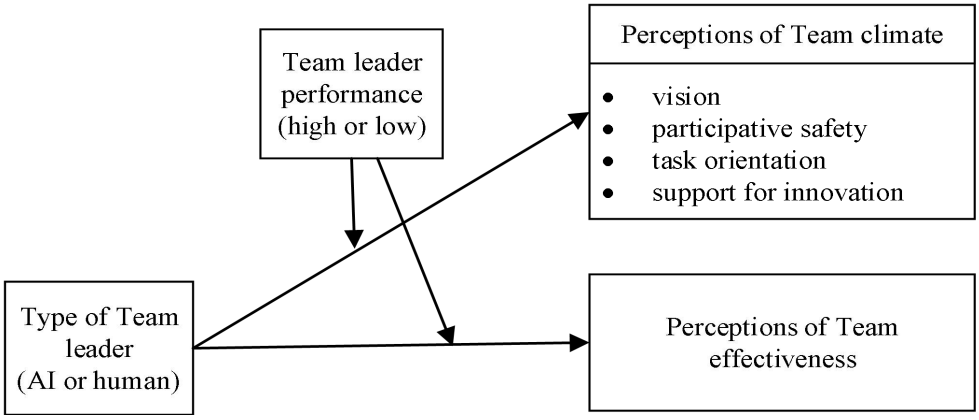



Figure 2: research model

## METHODLOGY

This study uses scenario experiments as the main data collection method. The first experiment was to test the main effect of the independent variable leadership type (AI vs. human) on the dependent variables team climate and team effectiveness. The second experiment was to test the relationship between leader performance and leader type and the dependent variables team climate and team effectiveness. The moderating role of relationships. Both Experiments 1 and 2 required subjects to first read a piece of scenario material and substitute it into it, and finally fill out a questionnaire based on the prompts and the experience of substituting the reading material.

**Study 1**

***Data collection***

Study 1 recruited 116 college students in China online and randomly assigned them to two situations (AI vs. humans) as team leaders. After excluding invalid questionnaires, 116 valid data were obtained in Experiment 1, with 58 people in the AI group and 58 people in the human group respectively. The demographic information of the respondents is shown in Table 1. As can be seen from Table 1, there were slightly more men than women surveyed, and most of the respondents were between 21 and 30 years old (75.9%). People in this age group are generally young people who are more receptive to new things and new trends (such as AI being their own leader), which makes sense. In addition, almost all respondents have undergraduate or above educational experience (98.3%).

Table 1: Demographic profile

| Items | Options | Frequency | Percent | Mean | Standard deviation |
|---|---|---|---|---|---|
| sex | male | 66 | 56.9 | 1.430 | 0.497 |
| | female | 50 | 43.1 | | |
| age | under 20 years old | 21 | 18.1 | 1.880 | 0.478 |
| | 21-30 years old | 88 | 75.9 | | |

| | | | | | |
|---|---|---|---|---|---|
| | 31-40 years old | 7 | 6 | | |
| | 41-50 years old | 0 | 0 | | |
| | 51-60 years old | 0 | 0 | | |
| | over 60 years old | 0 | 0 | | |
| degree | elementary school and below | 0 | 0 | 5.830 | 0.837 |
| | junior high school | 0 | 0 | | |
| | general high school/technical secondary school/technical school/vocational high school | 0 | 0 | | |
| | specialist | 2 | 1.7 | | |
| | undergraduate | 46 | 39.7 | | |
| | master | 38 | 32.8 | | |
| | PhD | 30 | 25.9 | | |

***Data analysis***

Reliability Analysis:This study uses Cronbach's α coefficient for reliability analysis. Generally, when Cronbach's α>0.7, it indicates that the scale has higher consistency and higher reliability. As shown in Table 2, the reliability coefficient values of the data in this study all exceed 0.9, indicating that each latent variable has good reliability and provides strong support for subsequent analysis.

Table 2: Reliability analysis

| Items | Number of items | Cronbach's α |
|---|---|---|
| Vision | 4 | 0.988 |
| Engagement security | 4 | 0.969 |
| Task orientation | 3 | 0.965 |
| Support for innovation | 3 | 0.963 |
| Team effectiveness | 8 | 0.967 |
| Team climate | 14 | 0.933 |
| All items | 22 | 0.902 |

Validity Analysis:This study used SPSS 27.0 to analyze the validity of the data. The KMO values of each variable are shown in Table 3. They are all greater than 0.7, indicating that the scale questions have good validity.

Table 3: Validity analysis

| Items | Number of items | KMO |
|---|---|---|
| Vision | 4 | 0.894 |
| Engagement security | 4 | 0.862 |
| Task orientation | 3 | 0.781 |
| Support for innovation | 3 | 0.723 |
| Team effectiveness | 8 | 0.914 |
| Team climate | 14 | 0.929 |
| All items | 22 | 0.924 |

Common Method Deviation Test and Multicollinearity Test:Harman's single factor test was used to test the sample for common method deviation. The results show that the explanation rate of the first factor is lower than the recommended threshold of 50%, indicating that there is no serious common method bias in the data of this study.

Hypothesis test-Correlation Analysis:As shown in Table 4, the means and standard deviations for Experiment 1 are presented. The multivariate analysis of variance GLM (also known as MANOVA) revealed that whether the team leader is human or AI significantly affects six dependent variables related to team climate and team effectiveness. Having an AI as the team leader, as opposed to a human, results in team members perceiving a clearer team vision (($M_{AI}$=6.069, $M_{Human}$=1.534, F=1281.844, p=0.000), higher participation safety ($M_{AI}$=5.461, $M_{Human}$=1.647, F=518.096, p=0.000), greater task orientation ($M_{AI}$=5.816, $M_{Human}$=0.646, F=372.642, p=0.000), and a better team climate ($M_{AI}$=5.275, $M_{Human}$=2.573, F=741.567, p=0.000), but it is less supportive of innovation than human leadership ($M_{AI}$=3.753, $M_{Human}$=4.5, F=6.069, p=0.015). Additionally, the results indicate no significant difference in the impact of AI and human leadership on team effectiveness ($M_{AI}$=4.397, $M_{Human}$=4.509, F=0.163, p=0.687). In summary, Hypotheses 1a, 1b, 1c, 1d,2 and 3 are supported.

Table 4: Treatment level means (and standard deviations)

| Type of leader | AI | | Human | |
|---|---|---|---|---|
| | M | SD | M | SD |
| Vision | 6.069 | 0.753 | 1.534 | 0.602 |
| Engagement security | 5.461 | 1.093 | 1.647 | 0.659 |
| Task orientation | 5.816 | 0.646 | 0.646 | 1.088 |
| Support for innovation | 3.753 | 1.863 | 4.5 | 1.364 |
| Team effectiveness | 4.397 | 1.548 | 4.509 | 1.441 |
| Team climate | 5.275 | 0.552 | 2.573 | 0.516 |

**Study 2**

***Data collection***

Study 2 used the Credamo platform to recruit 108 people online to conduct an online 2 (AI vs. human) * 2 (high performance vs. low performance) scenario experiment, and randomly assigned them to four experimental scenarios. After excluding invalid questionnaires, Experiment 2 obtained 100 valid data, including 25 people in each of the four scenarios. The demographic information of the respondents is shown in Table 5. As can be seen from Table 5, more women than men were surveyed, and more than half of the respondents were aged between 21 and 30 (57%). People in this age group are generally young people who are more receptive to new things and new trends (such as AI being their own leader), which makes sense. In addition, almost all respondents have undergraduate or above educational experience (93%).

Table 5: Demographic profile

| Items | Options | Frequency | Percent | Mean | Standard deviation |
|---|---|---|---|---|---|
| Sex | male | 24 | 24 | 1.760 | 0.429 |
| | female | 76 | 76 | | |
| Age | under 20 years old | 11 | 11 | 2.280 | 0.766 |
| | 21-30 years old | 57 | 57 | | |
| | 31-40 years old | 26 | 26 | | |
| | 41-50 years old | 5 | 5 | | |
| | 51-60 years old | 1 | 1 | | |
| | over 60 years old | 0 | 0 | | |
| Degree | elementary school and below | 0 | 0 | 5.320 | 0.777 |
| | junior high school | 0 | 0 | | |
| | general high school/technical secondary school/technical school/vocational high school | 5 | 5 | | |
| | specialist | 2 | 2 | | |
| | undergraduate | 51 | 51 | | |
| | master | 40 | 40 | | |
| | PhD | 2 | 2 | | |

***Data analysis***

Reliability Analysis:As shown in Table 6, the reliability coefficient values of the data in this study all exceed 0.8, indicating that each latent variable has good reliability and provides strong support for subsequent analysis.

Table 6: Reliability analysis

| Items | Number of items | Cronbach's α |
|---|---|---|
| Team leader performance | 6 | 0.942 |
| Visio | 4 | 0.937 |
| Engagement security | 4 | 0.932 |
| Task orientation | 3 | 0.881 |
| Support for innovation | 3 | 0.937 |
| Team effectiveness | 8 | 0.949 |

| | | |
|---|---|---|
| All items | 28 | 0.978 |
| Team leader performance | 6 | 0.942 |

Validity Analysis:This study used SPSS 27.0 to analyze the validity of the data. The KMO values of each variable are shown in Table 7. They are all greater than 0.7, indicating that the scale questions have good validity.

Table 7: Validity analysis

| Items | Number of items | KMO |
|---|---|---|
| Vision | 4 | 0.894 |
| Engagement security | 4 | 0.862 |
| Task orientation | 3 | 0.781 |
| Support for innovation | 3 | 0.723 |
| Team effectiveness | 8 | 0.914 |
| Team climate | 14 | 0.929 |
| All items | 22 | 0.924 |

Common Method Deviation Test and Multicollinearity Test:Harman's single factor test was used to test the sample for common method deviation. The results show that the explanation rate of the first factor is 23.818%, which is lower than the recommended threshold of 50%, indicating that there is no serious common method bias in the data of this study.

Hypothesis test-Correlation Analysis:Table 8 gives the treatment means and standard deviations. Table 8 provides the means and standard deviations for the treatments. The multivariate analysis of variance GLM (also known as MANOVA) revealed that leadership performance does not moderate the relationship between leadership type and team climate or team effectiveness. The interaction between leadership type and leadership performance had no significant effect on team effectiveness ($F(6,93) = 9.205$, $p = 0.588 > 0.05$). Similarly, the interaction between leadership type and leadership performance had no significant effect on team climate ($F(6,93) = 10.636$, $p = 0.832 > 0.05$). The results indicate that Hypothesis 4 is not supported.

Table 8: Treatment level means (and standard deviations)

| Type of leader | AI | | | | Human | | | |
|---|---|---|---|---|---|---|---|---|
| Leader performance | low | | high | | low | | high | |
| | M | SD | M | SD | M | SD | M | SD |
| Vision | 3.536 | 1.193 | 5.329 | 1.254 | 3.663 | 1.544 | 5.231 | 0.898 |
| Engagement security | 2.562 | 1.348 | 4.602 | 1.327 | 2.913 | 1.278 | 4.787 | 1.028 |
| Task orientation | 3.119 | 1.148 | 4.954 | 0.972 | 2.956 | 1.211 | 5.247 | 0.766 |
| Support for innovation | 3.048 | 1.307 | 4.182 | 1.702 | 3.261 | 1.524 | 5.444 | 0.722 |
| Team effectiveness | 3.308 | 1.185 | 4.915 | 0.900 | 3.348 | 1.446 | 5.134 | 0.786 |
| Team climate | 3.066 | 1.097 | 4.767 | 1.033 | 3.198 | 1.179 | 5.177 | 0.684 |

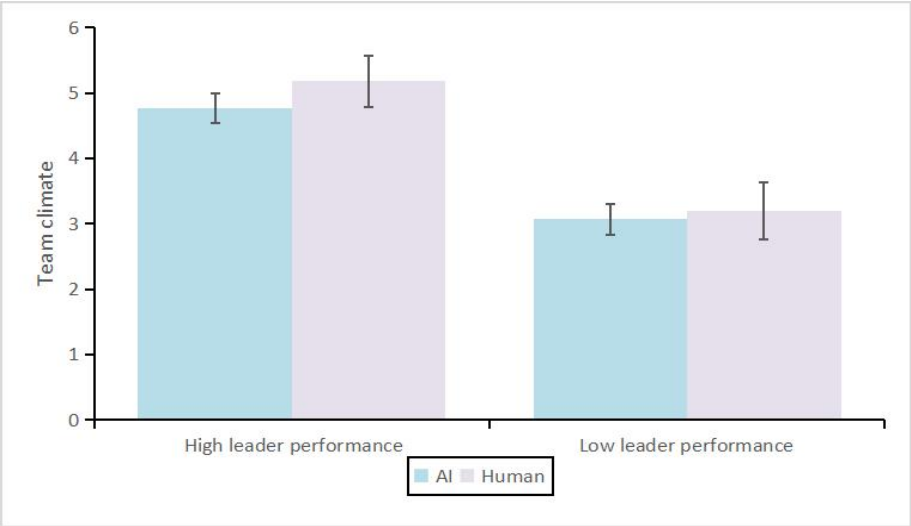



Figure 3: The moderating effect of leadership performance on leadership type and team climate

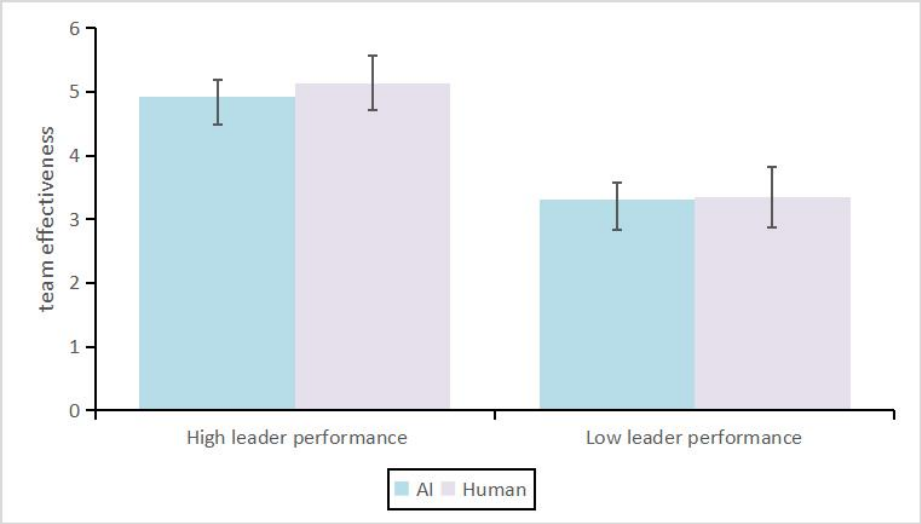



Figure 4: The moderating role of leadership performance in leadership type and team effectiveness

## DISCUSSION

### Discussion on Results

This study focuses on the background of AI and human collaboration. Based on the theory of social information processing, data are collected through scenario experiments, and multivariate variance method is used to explore the relationship between several key variables. The results are as follows.

The type of team leadership has a significant impact on the team members ' perception of team climate and team effectiveness. In the context of AI collaboration with people, AI leaders send information to team members that AI is not selfish and has strong algorithmic capabilities. According to social information processing theory, people will obtain information from complex environments to obtain an assessment of the environment. Therefore, compared with humans as team leaders, team members will think that AI as team leaders has better vision, participation safety, task orientation and overall team atmosphere, while innovation support is not as good as human leadership because AI only focuses on results and does not focus on processes. There is no significant difference in the impact of AI and human leadership on team effectiveness. Leader performance does not play a moderating role in the relationship between leadership type ( AI vs.human ) and team climate and team effectiveness.

### Theoretical Implications

Artificial intelligence and human collaboration have attracted the attention of scholars at home and abroad. However, there is a lack of research on the impact of introducing AI into the team to assume the role of leader on the team. This study constructs a model from the perspective of social information processing theory, and empirically tests the role of leadership type ( AI vs. human ) in team climate and team effectiveness under the background of AI and human collaboration, which enriches relevant research. In addition, the results show that leader performance will narrow the difference in the impact of AI leadership and human leadership on team climate, and enrich the research on the impact of leadership on team effectiveness.

**Managerial Implications**

By exploring the relationship between team leadership type ( AI vs.human ) and team climate and team effectiveness, this study explores the moderating role of leader performance, and provides insights for companies that are conducting or planning to allow AI to collaborate with employees to expand the space in which AI can play a role. Give full play to the role of AI in team collaboration to create a better team climate and enhance team effectiveness.

**Limitations and Future Research**

First of all, all the variables in this study are measured by self-assessment scales, and future research can collect data by means of peer assessment. Secondly, although this study proves the relationship between leadership type ( AI vs. human ) and team climate, the relationship between leadership type ( AI vs. human ) and team effectiveness can be further studied. At present, there is a lack of systematic research on the impact of AI as a team leader on the team in the academic community. This study provides a new direction for future research. Third, future research can explore the influencing factors of team atmosphere and team effectiveness in AI and human collaboration from various aspects such as team size, enterprise nature, and industry background, and can also dig deeper into the factors that may play a mediating role between the two. Finally, future research can conduct longitudinal studies on participants to observe the dynamic changes of variables over time, and to understand the impact of leadership type ( AI vs. human ) on team climate and team effectiveness more comprehensively.

## ACKNOWLEDGMENT

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