

The Influence Mechanism of Authentic Leadership in Artificial Intelligence Team on Employees' Performance

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Abstract. The impact of Artificial Intelligence(AI) on industrial change has transformed the practice of enterprise management, and impacted the traditional management theory born in the industrial era. This paper discusses the impact of AI on the practice and theory of enterprise management, including the transparency of human beings and the employ ability of AI. Based on the characteristics of the AI technology development team. In this study, 102 AI technology team leaders and 697 team members from AI companies in China were used as subjects both to investigate the influence mechanism of AL at both the individual and team levels and to explore the cross-level relationship between the two levels. The results show that at the individual level, the psychological safety plays a mediating role between individual-oriented AL behavior and an individual's performance. At the team level, the team's atmosphere plays a mediating role between team-oriented AL behavior and the individual's performance. This study has important implications for the theory of leadership behavior and leadership practice. AI belongs to a new type of technology, and the pressure of technology development work is great. It will display a kind of authentic leadership and can effectively promote the technology of the subordinates.

1. Introduction

Luthans and Avolio have defined AL as "a process that draws from both positive psychological capacities and a highly developed organizational context, which results in both greater self-awareness and self-regulated positive behaviors on the part of leaders and associates"[1]. AL is a positive, authentic, and ethical leadership style that is generally recognized as a positive organizational leadership method and that can help companies cope with various challenges[2,3,4]. By reviewing the literature, we found that previous studies have separately addressed the role of AL at the individual level[5]and at the team level[6]. At the individual level, many scholars have investigated AL's impact process on follower outcomes[7]. For examples, Avolio et al. (2005) believe that AL exerts an influence on followers' attitude, behavior and performance through key psychological processes. At the team level, empirical studies on AL's influence process on a AI team's output have been relatively rare. Walumbwa et al. (2008) use US financial institutions as subjects and confirm that AL can strengthen a team's psychological capital and interpersonal trust relationships[8]. Previous studies have addressed the role of AL at the single level (either individual level or team level) but not AL's cross-level influence mechanism from the perspective of multiple levels[9]. The studies from the isolated individual level or team level have ignored the interactions and relationships between these two levels and thus have been unable to fully reveal AL's role.



According to open systems theory, leadership phenomena at the individual and team levels are strongly correlated with performance[10]. Leadership is multilevel by nature, AL's action mechanisms will not be comprehensively and systematically understood[11]. The effectiveness of AL is ultimately reflected in its impact on performance [12]. Therefore, this study focuses on AI technology development team AL's process of influencing the performances of individuals to investigate the positive role of AL and to reveal AL's cross-level influence processes on individual performances. At the same time, this study describes the dynamic interaction between the two levels.

2 Model and hypotheses

2.1 Research model

The multiple hierarchy theory indicates that in addition to the influence of different personality traits, a staff member's behavior and attitude are affected by the "pond" to which he or she belongs, i.e., the influence of the AI team and organization on the staff[13]. However, in conventional studies of employee behavior and performance, only differences among the individuals have been fully considered: differences at the AI team and organizational levels have been ignored. Ignoring differences at the secondary or even the tertiary level may lead to error, i.e., the conclusions drawn at the individual employee level might be enlarged or reduced. Studies that have only considered influences and relationships at the individual level may lead investigators to different conclusions in different contexts.

In this study, to avoid the defects of traditional single-level research methods and to understand the mechanism of action of the AL more comprehensively and systematically, a multilevel linear model based on the multilevel theory was employed to construct a cross-level model of mechanism of action of AL (Figure 1).

We agree with the view that "the essence of leadership is a multi-layered phenomenon". The leadership phenomenon exists not only between the individual leader and his or her followers but also between the leader and his or her AI technology development team[7]. Therefore, the AL was divided into individual-oriented AL and team-oriented AL, which originate from the subordinator's evaluation of AL behavior. Individual-oriented AL represents the perception of leader behavior by employees in their interactive process with the leader that belongs to leadership constructs at the individual level, i.e., the individual perception of "AL" by each AI team member originates from the evaluation of the AL behavior by different individuals on the team. Team-oriented AL represents the perception of leader behavior by all of the employees on the AI technology development team and belongs to the leadership constructs at the team level, i.e., the public behavior that is perceived by all of the members and that is exhibited in the AI technology development team by leader consistent with its deep-rooted personal values and beliefs through encouraging different ideas and establishing a collaborative network of relationships with followers not only to earn their respect and trust but also to be recognized by those followers as adopting honest, ethical approaches.

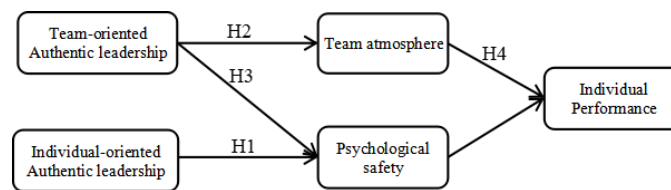


Figure 1. The influence mechanism model of the influence of multilevel-oriented AL on performance

2.2 Hypotheses

2.2.1. Individual-oriented AL process. As shown in Figure 1, individual-oriented AL exerts an indirect effect on individual performance through psychological safety. First, AL's positive mentality can be passed to followers through the role model effect of leader, which generates positive emotion and trust in followers [14]. Emotion is an important dimension in the psychological safety structure[15]. Members under positive emotions and high trust reward leader by providing higher performance. Second, AI technology team authentic leaders makes followers more respectful and loyal through establishing role models and high ethical standards[16]. Followers with a high degree of loyalty strengthen their identity with leader and therefore strong interpersonal relationships between leaders and followers are established and maintained. Finally, a good interpersonal relationship between employees and their leader (i.e., a higher psychological safety) can make employees feel like they have more authorizations and thus enhance job performance[14]. These studies show that AL behavior is conducive to better relationships between AI technology development team leader and team members [16], whereas a high quality leader–member relationship will induce members to provide better performance[17]. Therefore, we propose the following hypothesis:

H1: Psychological safety plays the mediating role between individual-oriented AL and individual performance.

2.2.2 Team-oriented AL process. At the team level (Figure 1), we believe that team-oriented AL has an indirect influence on individual performance primarily through the mediating role of team atmosphere. First, AL can promote the generation of an atmosphere of trust within the AI technology development team[17]. Second, AL helps create an environment with open-information communications. Walumbwa et al. believe that AL demonstrates the value and safety of public sharing behaviors and causes followers both to have higher psychological security and to share information publicly, thereby facilitating improved individual performance[8]. Finally, AL promotes team identification among team members[9]. Therefore, we propose the following hypothesis:

H2: Team atmosphere plays a mediating role between team-oriented AL and individual performance.

2.2.3 Cross-level roles. First, it is believed that there is a positive correlation between team-oriented AL and psychological safety at the individual level. Team-oriented AL treats all team members with fairness, justice and openness, and this nondiscriminatory attitude greatly enhances the psychological security and trust not only between leader and followers but also among followers[5]; thus, it is beneficial to the production of a better psychological safety relationship. Based on the above discussion, we propose the following hypothesis:

H3: There is a positive correlation between team-oriented AL and psychological safety.

Second, it is believed in this study that there is a positive correlation between team atmosphere at the team level and individual performance at the individual level. Interaction between all of the leaders and followers and interaction among followers occurs in a dynamic environment. The structure theory of organizational behavior science proposed by Xu Guang (2018) observes that the openness of information, support, and trust among AI technology development team members provided by the working environment exerts significant influence on both leaders and followers' job performance[17].

AL not only enhances the level of followers' trust but also creates an atmosphere of identity, openness and trust within the AI technology development team[8]. Accompanied with increased identity, the open exchange of information and mutual trust among AI team members, employees' performance can be greatly improved[6]. Therefore, employees working in a positive team atmosphere are more prone to generate high job performance. Based on the above discussions, we propose the following hypothesis:

H4: There is a positive correlation between team atmosphere and individual performance.

3. Design of the study

110 leader questionnaires and 805 AI team member questionnaires were issued, with an average AI technology development team size of 7.32. The paired samples of 102 leader questionnaires (with a valid rate of 92.7%) and 697 AI technology development team member questionnaires (with a valid rate of 86.6%) were collected. Among the valid samples, the average number of AI team members was 6.83; among the AI technology development team leaders, males accounted for 77.4% and leaders with an undergraduate degree or above accounted for 89.7%. Leaders' average age was 37.5 years, and their average experience in the AI technology development team leader was 4.93 years. Among the AI technology development team members, males accounted for 77.4%; members with an undergraduate degree or above accounted for 87.4%, with an average age of 28.6 years old and an average experience on the current AI technology development team of 19.1 months.

In this study, relevant measurement scales were derived from reports by Western scholars. The scale adopted Likert five-point scoring (1 = strongly disagree; 5 = strongly agree).

4. Data analysis and results

4.1 Aggregation test

Because team-oriented authentic leadership and team atmosphere were defined at the team level, three commonly used indicators in multilevel studies—i.e., Rwg (within-group agreement), ICC (1) (intra-class correlation (1)) and ICC (2) (intra-class correlation (2)) proposed by Bliese—were used to ensure theoretical and empirical support for the aggregation. The indicators for the team level in this study are shown in Table 1, including the specific values of team-oriented AL and team atmosphere. The measured variables were in line with the requirements of data aggregation at the team level.

Table 1. Aggregate analysis of the data

Variable	Rwg	ICC(1)	ICC(2)
Team-oriented AL	0.831	0.106	0.913
Team atmosphere	0.825	0.132	0.926

4.2 Validity analysis

Although in this study the individual's performance was assessed by the AI technology development team leader and thus can effectively overcome the problem of common method bias, confirmatory factor analysis (CFA) on five variables—i.e., individual-oriented AL, psychological safety, team atmosphere and employee performance—was still performed using AMOS21.0 to ensure the discriminant validity of the data. The results are listed in Table 2. Table 2 shows that the validity of the five-factor model was ideal and met the above criteria.

Table 2. Confirmatory factor analysis (N = 697)

Model	χ^2/df	GFI	AGFI	TLI	CFI	RMSEA
Proposed model	5-factor 1.887	0.945	0.917	0.968	0.976	0.051

4.3 Correlation analysis

Table 3 shows the correlation coefficients among the variables at the individual and team levels, along with the means and standard deviations. To determine the control variables, the zero-order correlations between the demographic variables and the outcome variables were examined and the results show that at the individual level, there was no significant correlation between the individual's performance and any of the demographic variables. At the team level, there was also no significant correlation between the demographic variables and the outcome variables.

Table 3. Correlation coefficient, mean and standard deviation of the variables

Variable	Mean	SD	1	2	3	4	5	6	7
Individual-level variables (N = 697)									
1. Member's gender	1.442	0.497	-						
2. Member's age	3.024	1.023	0.072	-					
3. Education	2.451	0.814	0.053	0.102	-				
4. Tenure	3.168	0.748	0.053	0.058	-0.029	-			
5. Individual-oriented AL	4.139	0.675	0.019	0.025	0.034	-0.027	-		
6. Psychological safety	3.478	0.749	0.004	0.007	0.017	0.076	0.472**	-	
7. Individual's performance	3.901	0.732	0.067	0.049	0.093	0.024	0.213**	0.467*	-
Team-level variables (N = 697)									
1. Leader's gender	1.226	0.175	-						
2. Leader's age	4.011	0.861	0.112*	-					
3. Leader's education	2.798	0.683	0.093	0.002	-				
4. Leader's tenure	4.032	0.715	0.034	0.133*	0.102	-			
5. AI technology development Team size	6.83	2.742	-0.007	0.035	0.004	0.047	-		
6. Team-oriented AL	2.793	0.641	-0.064	0.079	0.056	0.032	0.047	-	
7. Team atmosphere	3.596	0.753	0.081	0.082	0.089	0.076	0.012	0.436*	-

Note: male = 1; F = 2. * represents $p < 0.05$, ** represents $p < 0.01$. The values are the same below.

5. Conclusions and discussion

In this study, using AI team of Chinese enterprises as samples, the positive impact and the action mechanism of AL on employee performances were explored from the multilevel perspective. Based on the literature review, a series of hypotheses (hypotheses 1-4) were proposed and subsequently tested through aggregation tests, a correlation analysis, hierarchical regression and a multilevel linear model analysis. The results show that most of the hypotheses were valid.

First, at the individual level, it was demonstrated that individual-oriented AL had a direct and indirect positive impact on individual performance. Second, for the AI technology development team as a whole, team-oriented AL exerts influence on team individual through team atmosphere. Finally, cross-level effects were partially supported. The results show, first, that team-oriented AL had significant effect on psychological safety, i.e. This is likely because theoretically, psychological safety is based on the "circle" theory in which within a AI technology development team that has limited resources, psychological safety is significantly different for different team members. Team-oriented AL is the average of AI technology development team members' perceptions of AL, whereas the essence of psychological safety is the difference-i.e., there are differences in AI technology development team members' perceptions of psychological safety, and it is theoretically very difficult for those differences to reflect the AL group average. Therefore, this study confirmed the cross-level positive influence of team atmosphere at the team level on the employee performance at the individual level.

6. Implications and limitations

6.1 Theoretical significance

In this study, the empirical study on AL in the Chinese context was extended to the team level, thus bridging the gap between the multilevel-oriented AI technology development team's AL and studies of performance, and it provides a new direction for an integration study on AL and performance. The results of this study have certain implications for management practices. The team leader should pay close attention to team orientation in the daily work; create trust between team leaders and team members and among team members. Using this team-oriented leadership style, leaders can effectively promote enhanced employee performance at both the individual and team levels through cooperation among team members and followers' perceptions of leaders' support of employees[12].

6.2 Limitations and future directions

Due to various objective and subjective limitations, this study has some limitations that can be improved in future studies. In future studies, the intrinsic relationship among the above-mentioned variables should be analyzed in more detail through a tracking study. In choosing the samples, only the AI team leaders and team members were used as subjects, whereas the personal characteristics of individuals from different types of teams were not taken into account. Finally, this study attempted to elucidate the influence mechanism of the effect of multilevel-oriented AL on performance at the individual and team levels, which is only a preliminary exploratory study. There remain many issues for further study. In future studies, we wish to identify other mediatory variables and include them in the relationship model between AL and performance to enrich the model.

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