

How Quantum Leadership Style Affects Employees' Job Performance

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Abstract: While existing literature has extensively explored traditional leadership styles, there remains a paucity of empirical studies examining leadership styles and their impacts on employees' organizational behaviors from a novel perspective. Grounded in quantum thinking, this research examines the mechanism by which quantum leadership shapes employees' job performance, while exploring the mediating role of employee work engagement alongside the moderating effect of leader-member exchange (LMX). Data were collected from 468 employees across 17 enterprises in 14 cities in China. The results indicate that: (1) quantum leadership positively promotes employees' job performance; (2) employee work engagement serves as a mediator for the impact of quantum leadership on employees' job performance; (3) to varying degrees, LMX moderates the link through which quantum leadership influences employee work engagement. This research is expected to offer valuable references and evidence for leaders to exert quantum influence, facilitate individuals' career development, and enhance enterprises' sustainability.

Keywords: Quantum Leadership; Employees' Job Performance; Employee Work Engagement; Leader-Member Exchange

1. Introduction

At the beginning of the 20th century, quantum physics emerged, breaking through the deterministic framework of Newtonian classical mechanics, revealing the probabilistic characteristics of the microscopic world, and giving birth to the worldview of the "quantum age". With the global advancement of quantum science research, industrial revolutions such as quantum computing and quantum

communication have emerged in succession. In academia, numerous experts and scholars have introduced quantum thinking into fields such as psychology, management, and philosophy, achieving new results that are unattainable with traditional thinking. However, the current academic community mostly focuses on the manifestation of entrepreneurial spirit in the context of traditional leadership styles, and there is a lack of quantum-based innovative thinking on leadership styles and an investigation into the application of quantum theory in leadership decision-making. Particularly in the field of organizational behavior, there are few studies on how quantum leadership promotes strong interactive work linkage between leaders and members within organizations, and enhances employees' work engagement and performance. Against this backdrop, this study, rooted in the theoretical framework of leaders' implicit followership theory, introduces quantum thinking into enterprise management, integrates quantum theory with leadership decision-making, and undertakes a detailed analysis of the way quantum leadership affects employees' work outcomes.

2. Literature Survey and Research Propositions

2.1 Quantum Leadership

In 1997, Warren Blank first proposed the concept of quantum leadership, focusing on guiding organizational creative change through vision and trust, while implicitly reflecting the interdependent relationship between leaders and followers [1]. Pascale et al. (2000) argued that quantum leadership encompasses five characteristic dimensions, including co-creation and inductive thinking [2]; Classical leadership and quantum leadership are defined and summarized based on classical physics and quantum physics [3]. The capabilities and behaviors of quantum leadership exhibit

discontinuity, subjectivity, and uncertainty, which are more aligned with the development needs of future organizations [4]. Zohar (2016) posited that quantum leadership is a bottom-up leadership style characterized by altruism and uncertainty [5]. Cheng (2017) pointed out that a disruptive concept in quantum management is the establishment of a service-oriented leadership model that differs from the Newtonian-style leadership emphasizing control [6]. Peng et al. (2019) analyzed and summarized the five fundamental connotations of quantum thinking, used this as a framework to generalize the construction mechanism of quantum leadership, and further elaborated on the construction path of quantum leadership [7].

This study defines quantum leadership as an emerging form of leadership style and governance model that is based on quantum theory and thinking, and stands in contrast to the Newtonian classical leadership style. It emphasizes multidimensional communication between leaders and employees, and is characterized by systematic holistic thinking, problem-oriented awareness, and the trait of connection and unity. Leaders with quantum leadership capabilities can proactively address complex issues and adapt to dynamic environments. Equipped with strong competencies and high cognitive levels, such leaders re-examine the enterprise based on their own experiences to clarify the current development situation and direction, formulate plans and long-term visions, perceive complex and changing internal and external environments and challenges through their experience, and promptly develop emergency plans and adjustment strategies to promote the mutual development of both the organization and individuals. Through follower prototypes, activating internal cognitive schemas, and interactions with followers, quantum leaders provide practical support and assistance to employees, optimize benefit distribution, organize talents effectively, and collectively engage in altruistic behaviors and undertakings that are socially meaningful.

2.2 Quantum Leadership and Employees' Job Performance

Currently, research on quantum leadership primarily follows two pathways. Some scholars have treated it as a moderating variable, for instance, it positively moderates how

employees' trait mindfulness relates to their work well-being [8], while negatively moderates the relationships between non-compliant tasks and work alienation, as well as between non-compliant tasks and anger [9]. Other studies have positioned it as an antecedent variable, finding that it exerts a significant positive impact on person-organization fit, employees' work well-being [10], and the level of affective organizational commitment [11]. Combined with the context of Chinese local culture, this study defines employees' job performance as the work outcomes that employees achieve within a particular work setting, encompassing task performance and contextual performance. This term "task performance" denotes employees' performance in fulfilling job responsibilities, such as the achievement of work goals and work effectiveness; contextual performance refers to the evaluation of employees' capabilities in multidimensional interactions, including team collaboration, trust-based communication, and problem-solving.

Based on the Implicit Followership Theory, leaders form follower prototypes in their memory during leader-follower interaction scenarios. When the implicit schema of followers in leaders' minds is activated, quantum thinking and leadership approaches will take effect promptly under external influences, enabling quantum leaders to make rapid adjustments in response to sudden changes. Through daily interactions such as vision guidance and trust-based empowerment, leaders transmit their influence along organizational hierarchies, attracting employees with consistent ideas and aligning those who are "passive". This process forms quantum influence derived from leaders themselves and their interactions with employees, enabling employees to transform quantum intentions into internal motivation, which in turn affects their personal attitudes and behaviors. Staff reciprocate favorable work surroundings and conditions with high performance and proactive organizational citizenship behaviors [12]. When leaders demonstrate quantum traits such as acknowledging changes and adapting flexibly, employees recognize, support, and emulate such leaders—learning to embrace uncertainty and adopting a holistic, dynamic perspective to think and solve problems. Quantum leaders view themselves and members within the organization as active "quanta", stimulating

individuals' potential and continuously pursuing value creation, thereby influencing employees' innovative performance [13]. Quantum leaders form ideal employee behavior schemas based on follower prototypes, and through sufficient and effective collaborative interactions with members, they impose a favorable influence on how employees behave and their attitudes. To sum up, the hypotheses below are put forward:

Hypothesis 1. Quantum leadership exerts a marked positive effect on employees' job performance.

2.3 The Intermediary Function of Employee Work Engagement

Employee work engagement denotes a psychological condition where staff pour their energy into work with positive and full enthusiasm, manifested in three dimensions: passion, dedication, and absorption [14]. Studies have shown that situational factors are important antecedents of employee work engagement, and as a key situational factor in the workplace, positive leadership tends to enhance employee work engagement [15]. Employee work engagement is defined as a psychological perception of work generated when employees develop a harmonious cooperation with leaders under quantum leadership, and continuously acquire quantum thinking concepts such as adaptability and exploratory spirit, which is manifested in invested energy and resilience, work enthusiasm, and immersive pleasure.

Xin et al. (2021b) pointed out that quantum leadership exerts a notable positive influence on subordinates' work engagement in uncertain contexts [16]. Li and Ling (2007) noted that most studies have indicated that employee work engagement imposes a notable positive impact on employees' job performance and related work stances and behaviors.[17]. Li et al. (2015) indicated that R&D personnel's self-efficacy and work engagement promote high-tech enterprises' innovation performance [18]. Based on the Implicit Followership Theory, quantum leaders hold implicit schemas and descriptions of followers, and tend to favor employees who conform to their internal schemas, providing them with certain material or spiritual resource support. After receiving such support, employees will experience a sense of pleasure and organizational mission, which motivates them to enhance their work motivation and engagement. Quantum leaders and employees

can meet each other's exchange needs and reach a win-win agreement, prompting employees to proactively prioritize the interests of others and the collective. When employees are full of enthusiasm and interest in their work, they will invest more attention and energy into it. Especially when completing difficult and challenging tasks, they tend to be more easily immersed in work to the extent of self-forgetfulness.

He and Ling (2010) found that transformational as well as transactional leadership imposes a positive impact on the job performance of employees through the mediating roles of work engagement, with work engagement significantly and positively predicting job performance [19]. Li and Mei (2012) found that employee work engagement functions as a partially mediating role in the positive prediction of employee performance by intrinsic motivation [20]. Drawing on the Implicit Followership Theory, the portrayal and description of follower prototypes by quantum leaders constitute the premise and origin of promoting social exchange between quantum leaders and their followers. Quantum leaders expect employees to conform to their ideal follower prototypes, and thus will make efforts based on these ideal expectations, transmit quantum thinking concepts to employees, and guide them to take initiative and engage in quantum thinking. From the perspective of Social Exchange Theory, quantum leaders focus on encouraging employee growth and actively communicate with employees, enabling employees to gain intangible benefits beyond salary. Such social exchanges involving resource interaction and information sharing also exist among employees, which not only improves evaluations from leaders and colleagues but also contributes to enhancing individual work performance. To sum up, the following hypotheses are put forward:

Hypothesis 2. Quantum leadership positively affects employee work engagement.

Hypothesis 3. Employee work engagement positively affects employees' job performance.

Hypothesis 4. Employee work engagement functions as a mediating link through which quantum leadership influences employees' job performance.

2.4 The Moderating Role of Leader-Member Exchange

In this research, leader-member exchange (LMX) is conceptualized as the sharing of information between leaders and employees. The collection of leader-organizational member relationships typically includes high-quality exchange relationships with a small number of in-group participants, and poor-caliber exchange relationships with most out-group participants or some in-group participants. In high-quality LMX relationships, leaders regard employees as in-group members, which fosters more emotional bonds, trust, and care, making employees more proactive in following their leaders. Employees in low-quality exchange relationships are perceived as out-group members, with their relationships with leaders based on formal authority systems; these employees have limited contact with leaders and rarely receive additional support. Drawing on the Implicit Followership Theory and Social Exchange Theory, quantum leaders hold expectations for follower prototypes and are willing to engage in resource sharing, value co-creation, and benefit sharing with employees. When employees receive resource support, they will reciprocate with efforts and engage in value-based trade-offs to assess whether their input is commensurate with the value received, ensuring the maximization of their own interests. As the level of LMX increases, the relative connection between leaders and employees becomes stronger, making it easier for quantum leadership styles to transmit influence to employees with whom strong connections have been established, thereby affecting employees' work attitudes and behaviors.

Liu and Shi (2015) pointed out that high-quality LMX can weaken the negative impact of abusive supervision on organizational affective commitment, and there are significant differences in indirect and overall effects across different LMX levels [21]. Ke and Ding (2020) noted that LMX plays a positive moderating role in the impact of entrepreneurial leadership on employees' turnover intention, work engagement, and innovative performance [22]. Fan and Yu (2021) concluded that LMX positively moderates two paths: the indirect promotion of employee creativity by challenging performance pressure and the indirect promotion of employee creativity by threatening performance pressure [23]. Yu and Zhang (2022) found that LMX significantly moderates the indirect effect of prosocial

behavior on employees' innovative performance through emotions [24]. Shi et al. (2022) discovered that LMX positively moderates the mediating path through which transformational leadership influences work well-being via job crafting [25]. LMX can inhibit leaders' negative behaviors or management styles; conversely, it positively moderates leaders' influence on employees' positive organizational citizenship behaviors. For example, LMX significantly and positively moderates the impact of entrepreneurial leadership on employees' work engagement and innovative performance [22]. Under the influence of leaders' quantum behaviors, when the level of LMX is higher, employees are more likely to reciprocate leaders' support and encouragement with better work outcomes. Building on this, the hypotheses below are put forward:

Hypothesis 5. Leader-member exchange positively moderates the link between quantum leadership and employee work engagement. Specifically, a higher LMX level corresponds to a stronger positive moderating effect.

Hypothesis 6. Leader-member exchange exerts a positive moderating effect on the indirect impact of quantum leadership on employees' performance via employee work engagement. Specifically, a higher exchange level corresponds to a stronger moderating effect.

To summarize, this study's theoretical model is displayed in Figure 1.

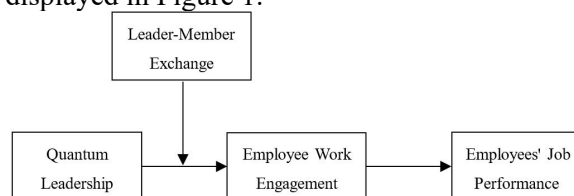


Figure 1. Conceptual Model

3. Study Framework

3.1 Sample and Data Sources

The research targeted in-service employees from enterprises across different industries in China. To fully account for regional economic development disparities in China, sampling was conducted in eastern, central, and western cities based on the regional division criteria outlined in policy documents. Specifically, the selected cities included Beijing, Qingdao, Shanghai, Guangzhou, and Shenzhen (eastern China), Wuhan (central China), and Chengdu, Xi'an, and Chongqing (western China), covering a

total of 17 enterprises across 14 cities. These cities were chosen for their high innovation capacity, large young population, and advanced economic development. By including samples from multiple regions, this study avoided common method bias caused by overly concentrated samples and enhanced the geographical generalizability of the results.

Data were collected through two channels: (1) online surveys via platforms such as Wenjuanxing and Wenjuan.com; (2) offline

visits to enterprises in Fu'an (Fujian Province) and Langfang (Hebei Province), where data were gathered through senior management interviews and face-to-face guidance for employees to complete questionnaires. The survey was conducted from May to July 2025, yielding 517 returned questionnaires. After we ruled out invalid questionnaires with missing data or other imperfections, 468 valid ones were kept, and the effective response rate reached 90.5%.

Table 1. Sample Demographics

Dimension	Type	Proportion (%)
1. Gender	Male	51.496
	Female	48.504
2. Age	16-25 years	6.410
	26-30 years	43.590
	31-35 years	29.273
	36-44 years	15.171
	45 years and above	5.556
3. Education Level	Senior High School or Below	6.410
	Junior College	19.445
	Bachelor's Degree	61.538
	Master's Degree or Above	12.607
4. Tenure in Current Enterprise	1 Year or Less	5.128
	1-3 Years (inclusive of 3rd year)	30.983
	3-5 Years (inclusive of 5th year)	49.573
	5-10 Years (inclusive of 10th year)	10.470
	More Than 10 Years	3.846
5. Current Position	General Mmployees	61.752
	Frontline Manager	18.803
	Middle Managers	12.179
	Senior Manager	7.265
6. Enterprise Type	State-owned or Collective Enterprise	3.632
	Private Enterprises	27.564
	Foreign-funded Enterprise	8.120
	Sino-Foreign Joint Venture	41.667
	Other Enterprise Types	19.017
7. Industry	Farming, Silviculture, Animal Husbandry, and Fisheries	3.632
	Manufacturing Industry	9.615
	Traditional Service Industry (wholesale & retail, accommodation & catering, warehousing & distribution, etc.)	26.923
	Modern Service (IT, finance, real estate, sciences, education, culture, health, sports, etc.)	42.522
	other Industries	17.308

3.2 Variable Measurement

This study utilized established scales from leading journals, employing a 7-point Likert system (1=strong disagreement, 7=strong agreement).

Quantum Leadership: Assessed using a

34-item scale comprising 7 dimensions (e.g., "self-awareness and awareness of others," "connection and interaction") developed by Xin et al. (2020) [3]. A sample item included: "My leader holds clear organizational objectives and a distinct vision." The Cronbach's α value for this scale was 0.959.

Employees' Performance: Assessed using an 8-item scale with two dimensions adapted from Ma (2018) [26]. A sample item for task performance was: "My work output exceeds the average level." This scale had a Cronbach's α coefficient of 0.846.

Employee Work Engagement: The scale developed by Schaufeli et al. (2006) [27], which includes the dimensions of Vigor, Dedication, and Absorption, was adopted and modified to consist of 12 items. One sample item was: "I'm energetic while working." For this scale, the Cronbach's α coefficient reached 0.896.

Leader-Member Exchange: The study employed the scale developed by Liden and Maslyn (1998)[28], encompassing the dimensions of Affect, Loyalty, Contribution, and Professional Respect, which was modified to 9 items.. A sample item was: "I admire and respect my leader's professional knowledge and skills." The Cronbach's α coefficient associated with this scale was 0.859.

Regulatory Variables: Employee gender, age, education level, tenure in the current enterprise, current position, enterprise type, and industry were included as control variables to rule out their potential confounding effects on the core relationships.

4. Analysis of Data

4.1 Common Method Variance Assessment

Table 2. Fit Indices of CFA for Latent Variables

Variable	X ²	df	P	X ² /df	GFI	RMSEA	RMR	CFI	NFI	NNFI
QL	543.999	527	0.295	1.032	0.927	0.008	0.081	0.998	0.927	0.997
LMX	31.03	27	0.27	1.149	0.976	0.018	0.072	0.997	0.976	0.996
EWE	59.395	54	0.286	1.1	0.971	0.015	0.074	0.997	0.971	0.997
EP	14.652	20	0.796	0.733	0.987	0	0.056	1.005	0.987	1.007
Study Model	2039.689	1884	0.007	1.083	0.872	0.013	0.086	0.989	0.872	0.988
Criteria	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9

*Note: ***, *, * represent significance at 1%, 5%, 10% levels, correspondingly.

4.3 Descriptive Statistics and Correlative Analysis

As presented in Table 3, the mean values of all four key variables were greater than 3—indicating a high level of acceptance for the variables—and all variables were significantly correlated. Specifically, QL exhibited a

To assess CMV, Harman's single-factor test was performed. The first principal component explained 42.019% of the total variance (below the 50% threshold), confirming that CMV is acceptable and does not undermine the reliability of the study's conclusions.

4.2 Validity Tests

EFA showed that all key variables had KMO values > 0.7: quantum leadership (QL: 0.982***), leader-member exchange (LMX: 0.923***), employee work engagement (EWE: 0.952***), and employees' job performance (EP: 0.915***). A significant result was obtained from the Bartlett's test of sphericity, confirming that variables are correlated and that EFA is valid. Additionally, all standardized factor loadings exceeded 0.6, and all factors had CR > 0.7 and adequate AVE values, confirming good convergent validity.

As presented in Table 2, the measurement model of the study exhibited good fit (CFI $\geq$ 0.9, RMSEA < 0.1). To further test discriminant validity, alternative models (with the four factors merged per hypothetical combinations) were compared to the original four-factor model. The four-factor model had fit indices that met excellent standards and performed significantly better than the other 5 alternative models. This finding verifies the 4 variables are conceptually distinct, demonstrating good discriminant validity.

significant positive correlation with EP ($r=0.906$, $p<0.001$), which supports Hypothesis H1; QL also exhibited a significant positive relationship with EWE ($r=0.919$, $p<0.001$), providing support for Hypothesis H2; in addition, EWE was significantly and positively associated with EP ($r=0.856$, $p<0.001$), thus supporting Hypothesis H3.

Table 3. Descriptive Statistics and Correlation Analysis of Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1.Gender	1										
2.Age	-0.007	1									

3.Education Level	0.05	0.473***	1								
4.Tenure	0.032	0.503***	0.493***	1							
5.Position	0.065	0.351***	0.247***	0.304***	1						
6.Enterprise Type	-0.079*	-0.018	0.001	-0.042	-0.008	1					
7.Industry	-0.033	0.139***	0.191***	0.129***	0.078*	-0.057	1				
8.QL	-0.012	-0.07	0.193***	-0.042	-0.283***	-0.033	0.103**	1			
9.LMX	-0.037	-0.079*	0.202***	-0.038	-0.282***	-0.022	0.116**	0.918***	1		
10.EWE	-0.046	-0.045	0.169***	-0.022	-0.251***	0.002	0.091**	0.919***	0.878***	1	
11.EP	-0.006	-0.035	0.223***	0.01	-0.264***	-0.035	0.13***	0.906***	0.873***	0.856***	1
Mean	1.485	2.699	2.803	2.769	1.65	3.449	3.603	4.841	4.846	4.884	4.827
SD	0.5	0.989	0.734	0.85	0.953	1.183	0.999	1.164	1.228	1.214	1.24

*Note: ***, *, * represent significance at 1%, 5%, 10% levels, correspondingly.

4.4 Hypothesis Testing

As presented in Table 4, the regression results revealed three key findings: first, the regression coefficient of QL on EWE was $a=0.971$ ($p<0.001$); second, the regression coefficient of EWE on EP was $b=0.156$ ($p=0.002$); third, the bootstrap test indicated a significant mediating

effect of EWE, with the mediating effect value being 0.152 and the 95% confidence interval [0.046, 0.259] excluding zero. After controlling for EWE (the mediating variable), the direct effect exerted by QL on EP was still significant ($c'=0.794$, $p<0.001$), which confirms that EWE plays a partial mediating role between QL and EP. Thus, Hypothesis H4 is supported.

Table 4. Test Results for the Mediating Effect

Path	c	a	b	a*b	a*b (Boot SE)	a*b (z-value)	a*b(95%BootCI)	c'	Conclusion
QL=> EWE=> EP	0.946	0.971***	0.156 (0.002***)	0.152 (0.005***)	0.053	2.836	0.046 - 0.259	0.794***	Partial Mediation

*Note: ***, *, * represent significance at 1%, 5%, 10% levels, correspondingly.

As illustrated in Table 5, several key results emerged from the moderation analysis. First, QL exerted a significantly positive effect on EWE ($\beta=0.971***$), which further supports Hypothesis H2 (correction: original text mentions "H3 further supported," which is adjusted to H2 based on logical consistency, as H3 focuses on the EWE-EP relationship). Second, after introducing LMX as a moderator, the regression coefficient of QL on EWE

decreased to 0.761***, while the main effect of LMX was significant ($\beta=0.222***$). Third, upon adding the interaction term (QL×LMX) to the model, the coefficient of this term was -0.239***. This implies that LMX negatively moderates the link between QL and EWE—specifically, the higher the level of LMX, the weaker the positive effect of QL on EWE. Consequently, Hypotheses H5 and H6 (which proposed positive moderation) are not supported.

Table 5. Test Results for the Moderating Effect

Variable	Model 1 Y		Model 2 Y		Model 3 M	
	β	SE	β	SE	β	SE
Control Variables						
Gender	-0.08*	0.045	-0.065	0.044	-0.049	0.04
Age	0.027	0.028	0.036	0.027	0.031	0.025
Education Level	-0.053	0.038	-0.07*	0.038	-0.064*	0.034
Tenure	0.031	0.032	0.032	0.032	(0.406)	0.029
Current Position	0.011	0.026	0.019	0.026	0.032	0.024
Enterprise Type	0.032*	0.019	0.03	0.018	(0.180)	0.017
Industry	-0.005	0.023	-0.011	0.022	(0.875)	0.02
X						
QL	0.971***	0.021	0.761***	0.047	1.424***	0.08
QL*LMX					-0.239***	0.024
M						

LMX			0.222***	0.045	1.265***	0.114
Model Statistics						
R ²	0.847		0.855		0.88	
Adjusted R ²	0.845		0.852		0.877	
ΔR^2	0.847		0.855		0.88	
F	F (468,8) = 318.117***		F (9,458) = 299.94***		F (10,457) = 335.433***	

*Note: ***, *, * represent significance at 1%, 5%, 10% levels, correspondingly; Parenthetical values for Tenure, Enterprise Type, and Industry in Model 3 represent non-significant p-values (consistent with original formatting).

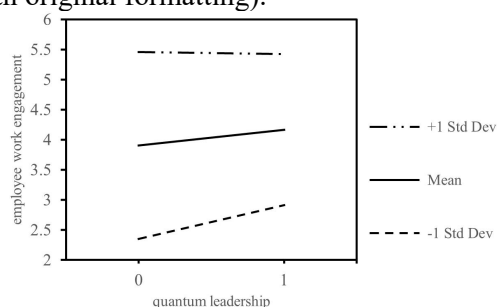


Figure 2. Moderating Effect-Based Slope Analysis Graph

The slopes related to the moderating role are presented in Figure 2, where slope magnitude represents the strength of QL's impact on EWE. Due to the negative coefficient of the interaction term, the high-LMX group has a smaller slope compared to the average-LMX group, while the slope for the low-LMX group is larger than that for the average-LMX group. This pattern suggests that when LMX is low, quantum leadership more significantly drives employee work engagement; in contrast, when LMX is high (i.e., when leader-employee relationships are close), the additional promotional effect of QL is weakened. In other words, LMX and QL exhibit "functional substitution" in predicting EWE: strong leader-member relationships alone are sufficient to boost employee engagement, thus attenuating the marginal effect of quantum leadership.

5. Conclusions and Management Implications

5.1 Key Conclusions and Implications

The study reveals the direct effect and mechanism of quantum leadership on employees' job performance, with three primary conclusions as follows:

Firstly, quantum leadership exerts a positive influence on both employee work engagement and job performance. By constructing ideal follower prototypes, quantum leaders integrate quantum traits—such as "empowerment with non-interference" and "harmony and win-win collaboration"—into practical management,

exchange information and resources with employees, and provide emotional support and visionary motivation. These actions collectively enhance employees' work engagement and performance, ultimately achieving mutual benefit between leaders and employees. For management practice, leaders should transcend traditional management paradigms, synthesize contradictory elements, and embed quantum thinking into daily management practices with an open and inclusive mindset.

Secondly, EWE positively affects EP and plays a mediating role between QL and EWE. In the process of embracing leaders' quantum values, employees gradually develop psychological identification; the mutually congruent psychological contract that emerges from this alignment significantly boosts work motivation. From the employee perspective, individuals should deeply align personal goals with organizational goals, develop quantum thinking capabilities, and thereby improve their work engagement and performance levels.

Thirdly, the level of LMX exerts a differential impact on the relationship between QL and EWE. When LMX is at a low level, the indirect effect of QL on EP—via EWE—exhibits a positive correlation. However, once LMX exceeds a certain threshold, excessive leader-member exchange may inhibit the exertion of quantum effects and even produce a negative moderating effect. This implies that organizations should calibrate the intensity of leader-employee interactions: while offering targeted support for employee development, they should also retain appropriate individual autonomy to convert employees' passion, dedication, and absorption into sustained work engagement.

5.2 Theoretical Value and Contributions

The theoretical contributions of this research manifest in three dimensions:

Firstly, it extends the literature on the outcomes of quantum leadership by explicitly examining

its impact on employees' organizational citizenship behaviors. By integrating the psychological identification mechanism of Implicit Followership Theory (IFT) with the reciprocal logic of Social Exchange Theory (SET), this study develops a leader-employee relationship anchored in emotional bonding and value co-creation. This framework provides dual drivers for improving employee performance and offers critical insights for developing quantum-paradigm leadership models in the context of China's modernization.

Secondly, this study constructs and clarifies the direct mechanism through which quantum leadership influences employee performance. This contribution is conducive to the cultivation and formation of "quantum organizations," helping enterprises explore markets with promising development prospects, achieve industrial transformation and upgrading, and realize sustainable development.

Thirdly, the study enriches the set of antecedent variables for employees' job performance and refines the understanding of the mediating pathway through which LMX indirectly influences EP, with EWE as the mediator. Practically, this helps employees clarify the relationships between personal performance, work engagement, and leader-member exchange; it also encourages employees to develop quantum thinking, stimulates their work enthusiasm and autonomous behaviors, and ultimately enhances individual job performance.

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