

Metacognitive Foundations of Adaptive Leadership Behavior: An Empirical Examination of Ambidextrous Leadership and Task Variety in Organizational Contexts

Keita Moriyama^{1*}, Yuki Arai² and Satoshi Fujimoto³

¹*Department of Management Studies, Faculty of Economics, Shimane University, Matsue, Japan*

²*Graduate School of Human Sciences, Osaka Metropolitan University, Osaka, Japan*

³*Faculty of Business Administration, Aichi University, Toyohashi, Japan*

¹*keita.moriyama.study@gmail.com*

Abstract

In contemporary organizations characterized by increasing complexity and uncertainty, leaders are required to continuously regulate their thinking and behavior in response to changing situational demands. From this perspective, the present study examines leaders' metacognitive regulation of creative thinking as a cognitive foundation for adaptive leadership behavior. Drawing on metacognition theory and the ambidextrous leadership framework, this study proposes a conditional process model in which ambidextrous leadership behavior mediates the relationship between leaders' metacognitive capability and employees' adaptive work behaviors, including role-congruent behavior and boundary-oriented activity. Furthermore, task variety is examined as a contextual condition that influences the strength of these indirect relationships. Data were collected from matched leader–member dyads across public and private organizations, and the proposed model was tested using structural equation modeling and bootstrapped mediation and moderation analyses. The results indicate that leaders with higher levels of metacognitive regulation are more likely to exhibit ambidextrous leadership behaviors, which, in turn, are associated with higher levels of employee adaptive behavior. In addition, the mediating role of ambidextrous leadership was found to vary depending on the degree of task variety, suggesting that leadership cognition and job design jointly shape behavioral outcomes within teams. This study contributes to the literature by clarifying the cognitive underpinnings of ambidextrous leadership and by demonstrating how leadership behavior and work characteristics interact to influence employee adaptation. The findings offer implications for leadership development and work design in organizations operating in dynamic, uncertain environments.

Keywords: *Creative metacognition, Ambidextrous leadership, Adaptive work behavior, Role-congruent behavior, Boundary-oriented activity, Task variety, Leadership cognition, Job design*

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*corresponding author

¹<https://orcid.org/0000-0003-4918-6274>

²<https://orcid.org/0009-0001-4311-1873>

1. Introduction

In recent years, organizations have been required to maintain stable operations while simultaneously responding to discontinuous environmental changes, such as rapid digitalization, intensified interorganizational dependence, and the diversification of stakeholder expectations. Under such conditions, leadership is increasingly expected to function not only as a source of direction and coordination but also as a mechanism that enables adaptive adjustment of collective work processes. In particular, contemporary work settings often demand that leaders support exploration (e.g., experimentation, idea generation, trial-and-error learning) while also ensuring exploitation (e.g., compliance, efficiency, reliability). This dual demand has prompted sustained scholarly attention to ambidextrous leadership as a behavioral pattern that flexibly combines opening and closing behaviors in response to situational requirements [1][2][3].

At the same time, recent research suggests that ambidextrous leadership may not consistently yield positive outcomes. Rather, the same leadership flexibility that enables innovation can also increase employees' burdens through higher role demands, ambiguity, or perceived inconsistency, depending on contextual features and how employees interpret leader behaviors [1]. Accordingly, a central issue is not merely whether ambidextrous leadership is “effective,” but when and through what process it is associated with desirable employee behaviors. This implies the importance of examining antecedent conditions that allow leaders to enact ambidexterity with sufficient coherence and contextual sensitivity.

From this perspective, leaders' cognitive and self-regulatory capabilities warrant closer examination. A promising candidate is creative metacognition, broadly understood as the capacity to monitor, evaluate, and regulate one's creative thinking in relation to task demands and situational constraints. This capability is not limited to generating novel ideas; it also involves reflective control over the stages of problem recognition, ideation, elaboration, and implementation, thereby connecting creative cognition to action-oriented managerial judgment [4]. In dynamic environments, such metacognitive regulation may be particularly consequential, as leaders must repeatedly decide when to loosen constraints to promote exploration and when to tighten them to ensure execution and consistency—decisions that closely align with the behavioral logic of ambidextrous leadership [2][3]. Despite this conceptual alignment, the cognitive foundations that make ambidextrous leadership enactment more likely, and potentially more effective, remain comparatively underspecified in empirical research.

In parallel, organizational behavior scholarship has continued to broaden its understanding of “employee effectiveness” beyond narrow performance indicators toward more behaviorally grounded constructs. Two domains are especially relevant in environments characterized by boundary permeability and cross-functional interdependence. The first concerns role-congruent behavior—actions aligned with formal expectations that sustain operational reliability and team coordination. The second concerns boundary-oriented activity—actions through which employees acquire, transfer, or broker information and resources across internal or external boundaries, supporting adaptation and innovation. Recent studies indicate that boundary-oriented activity can produce benefits (e.g., learning, coordination, innovation) while also introducing costs (e.g., information overload, competing demands), suggesting that both leadership support and contextual conditions shape whether such behavior is enacted and sustained [5]. Moreover, leader behaviors that explicitly support boundary work, such as boundary-spanning leadership, have been shown to affect employee outcomes through

intermediate processes (e.g., proactive work redesign), reinforcing the need to model mechanisms rather than relying on direct-effects assumptions [6].

A further issue is that the strength and meaning of leadership effects are likely contingent on job design features. Task variety (or task diversity) captures the extent to which a job requires engaging in multiple activities and applying diverse skills. This characteristic is often linked to richer learning opportunities and adaptive capability, but it also changes the extent to which employees rely on leader structuring versus self-directed regulation. Empirical evidence suggests that task variety can alter how leadership behaviors translate into work behaviors, functioning as a boundary condition that shapes the effectiveness of leadership influence [7]. In this sense, task variety is not merely a background descriptor; it can be conceptualized as a contextual parameter that alters the behavioral "space" available to employees, thereby shaping the pathways through which leadership influences role-congruent behavior and boundary-oriented activity.

Given these considerations, the present study adopts a conditional process perspective. It examines (a) whether leaders' creative metacognition is associated with ambidextrous leadership enactment, (b) whether ambidextrous leadership functions as a behavioral mechanism linking leader metacognitive capability to employee role-congruent behavior and boundary-oriented activity, and (c) whether task variety conditions these indirect relationships. This framing is intended to contribute in three modest but meaningful ways. First, it clarifies a cognitively grounded antecedent of ambidextrous leadership by focusing on metacognitive regulation as a prerequisite for flexible behavioral switching [2][3][4]. Second, it specifies a behavioral transmission pathway by positioning ambidextrous leadership as a mediator between leader cognition and employee behavioral outcomes, consistent with recent calls to address mixed or conditional effects of ambidextrous leadership [1][3]. Third, it incorporates job design as a contextual condition and tests whether the indirect effects vary by task variety, thereby aligning leadership research with contemporary job design perspectives [7].

In summary, rather than treating leadership ambidexterity as a uniformly beneficial style, this study examines a more nuanced model in which leader cognitive capability, leader behavioral enactment, and job design jointly shape employee behaviors relevant to organizational adaptation. Such a model is expected to be informative for organizations that seek not only to increase innovation-oriented activity but also to maintain reliable role performance in boundary-spanning, information-intensive environments [5][6][8]. The theoretical model and hypotheses are presented in the following section.

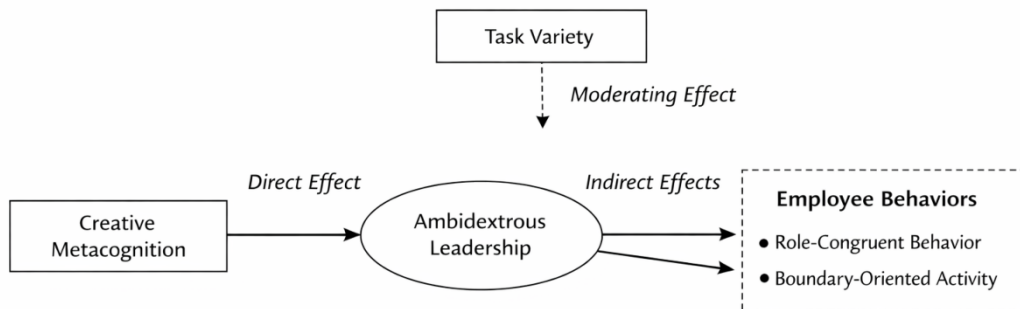


Figure 1. Theoretical model of metacognitive leadership, ambidextrous leadership, and employee adaptive behavior

Figure 1 summarizes the theoretical framework examined in this study. The model conceptualizes leaders' creative metacognition as a cognitive antecedent that supports the enactment of ambidextrous leadership behaviors. Ambidextrous leadership, characterized by the flexible combination of opening and closing behaviors, is positioned as a mediating mechanism through which leaders' metacognitive capability is associated with employees' adaptive work behaviors. These behaviors are represented by role-congruent behavior and boundary-oriented activity, reflecting both internal coordination and external adaptation within organizational contexts. In addition, task variety is modeled as a contextual condition that moderates the indirect relationships, suggesting that the strength of the leadership mechanism may vary with the complexity and diversity of employees' work tasks. By integrating leadership cognition, leadership behavior, and job design within a single framework, the model provides a structured basis for the hypotheses and empirical analyses developed in the subsequent section.

2. Theory and hypotheses

2.1. Creative metacognition as a leadership-level cognitive capability

In organizational contexts where leaders are required to balance exploration and exploitation, it is increasingly important to clarify the cognitive foundations that enable situationally appropriate behavioral switching. Metacognition, particularly in relation to creative problem solving, can be conceptualized as a regulatory capacity that supports planning, monitoring, and control across stages of creative cognition. Recent work has emphasized that metacognitive components (e.g., metacognitive knowledge, experience, monitoring, and control) are not peripheral to creativity; rather, they play a structuring role in how individuals evaluate ideas, allocate cognitive resources, and regulate the transition from ideation to implementation [9]. In addition, empirical scale-based research has advanced measurement approaches for metacognition in creative problem-solving settings; further supporting the view that creative metacognition can be operationalized as a relatively stable self-regulatory capability with behavioral implications in work contexts [10]. Furthermore, metacognitive control has been linked to performance on creative thinking tasks, suggesting that creativity-related outcomes are partly determined by an individual's capacity to regulate and evaluate cognitive outputs, rather than by divergent ideation [11].

When this regulatory capacity is considered at the leader level, creative metacognition may be regarded as a cognitive foundation that enables leaders to diagnose when openness is required (e.g., to enable experimentation) and when closure is required (e.g., to ensure disciplined implementation). This reasoning aligns with contemporary theorization that ambidextrous leadership involves the situational interplay of opening and closing behaviors, rather than the stable adoption of a single style [12]. Accordingly, leaders with stronger creative metacognitive regulation are expected to be better able to enact ambidextrous leadership in a coherent, context-sensitive manner.

Hypothesis 1. A leader's creative metacognition is positively associated with ambidextrous leadership.

2.2. Ambidextrous leadership as behavioral enactment of exploratory–exploitative demands

Ambidextrous leadership is commonly conceptualized as the behavioral combination of opening behaviors (e.g., encouraging variation, experimentation, and learning) and closing

behaviors (e.g., monitoring, standardization, and goal clarification), enacted in accordance with situational demands [12]. Recent empirical studies continue to report that ambidextrous leadership is associated with employee outcomes relevant to innovation and performance, often through intermediate psychological or behavioral mechanisms [13][14]. In addition, process-oriented evidence suggests that ambidextrous leadership may operate through knowledge-related mechanisms, such as knowledge sharing and knowledge search, which are central to coordinated adaptation in complex environments [15]. Taken together, these findings support positioning ambidextrous leadership as a plausible behavioral mechanism linking leader-level cognitive capability to employee behavioral outcomes.

2.3. Employee adaptive work behaviors: Role-congruent behavior and boundary-oriented activity

To examine leadership influence under contemporary work conditions, it is useful to focus on behavioral outcomes that reflect both operational reliability and external adaptation. Role-congruent behavior refers to actions aligned with formal role expectations and is commonly treated as a foundational behavioral component of coordinated performance. Meta-analytic evidence indicates that in-role and extra-role dimensions of role behavior show systematic relationships with antecedents and contextual factors, reinforcing the importance of distinguishing role enactment as a behavioral criterion rather than relying solely on attitudinal proxies [16]. Moreover, research on leadership and extra-role behavior continues to suggest that leader behaviors influence discretionary contributions through intervening psychological processes, implying that behavioral outcomes should be modeled within a mechanism-based framework [17].

Boundary-oriented activity reflects behaviors through which employees interact across organizational boundaries to acquire information, mobilize resources, and coordinate interdependence. Recent evidence indicates that boundary spanning can improve work outcomes through cognitive and status-related mechanisms, while also introducing potential costs that require buffering or regulatory support [18]. Relatedly, boundary buffering and boundary spanning have been shown to interact in ways that jointly shape both beneficial (e.g., mindfulness and performance) and detrimental (e.g., information overload) outcomes, suggesting that boundary-oriented activity should be conceptualized as an adaptive yet resource-sensitive behavioral domain [18]. In addition, leadership that supports boundary management has been empirically linked to employee outcomes via job crafting processes, reinforcing the relevance of leadership mechanisms in boundary-related behaviors [20].

On this basis, leader creative metacognition may be expected to relate directly to employee adaptive behaviors (via leader sensemaking, guidance, and resource orchestration). In contrast, ambidextrous leadership is expected to provide a behavioral pathway that translates leader cognition into employee role enactment and boundary-oriented activity.

Hypothesis 2. A leader's creative metacognition is positively associated with employees' role-congruent behavior.

Hypothesis 3. A leader's creative metacognition is positively associated with employees' boundary-oriented activity.

2.4. Effects of ambidextrous leadership on employee adaptive work behaviors

Ambidextrous leadership is expected to support role-congruent behavior by providing both enabling conditions (e.g., autonomy for problem solving) and structuring conditions (e.g., clarity, monitoring, and goal alignment). In parallel, ambidextrous leadership is expected to

support boundary-oriented activity by legitimizing external engagement while maintaining sufficient internal coordination and resource discipline. Empirical research in diverse settings has reported positive associations between ambidextrous leadership and employee-level adaptive outcomes, particularly innovation-related behavior and performance indicators [13][14]. Process research further suggests that ambidextrous leadership can activate knowledge-based pathways (e.g., knowledge search and sharing) that are structurally aligned with boundary-oriented activity [15]. Accordingly, ambidextrous leadership is expected to be positively associated with both role-congruent behavior and boundary-oriented activity.

Hypothesis 4. Ambidextrous leadership is positively associated with employees' role-congruent behavior.

Hypothesis 5. Ambidextrous leadership is positively associated with employees' boundary-oriented activity.

2.5. The mediating role of ambidextrous leadership

Given the conceptual alignment between leader-level metacognitive regulation and behavioral switching, ambidextrous leadership can be positioned as a mediator that translates leader cognition into employee adaptive behaviors. This is consistent with recent work emphasizing that ambidextrous leadership operates through intermediate mechanisms rather than exclusively through direct effects [13][14][15]. When leaders regulate the balance between exploration and exploitation in a context-sensitive manner, employees may receive clearer signals about when to prioritize disciplined role enactment and when boundary-oriented activity is legitimate and supported. Thus, ambidextrous leadership is expected to mediate the association between leader creative metacognition and both categories of employee adaptive behavior.

Hypothesis 6. Ambidextrous leadership mediates the relationship between a leader's creative metacognition and employees' role-congruent behavior.

Hypothesis 7. Ambidextrous leadership mediates the relationship between a leader's creative metacognition and employees' boundary-oriented activity.

2.6. The moderating role of task variety

Finally, it is necessary to consider job design as a contextual condition that alters the strength of leadership mechanisms. Task variety reflects the extent to which work involves diverse tasks and shifting demands. Contemporary work design theory continues to emphasize that task characteristics shape motivational and behavioral processes, including the extent to which employees rely on external structuring versus self-regulation [18]. Empirical evidence also indicates that task variety can moderate the relationship between leadership and work behaviors, suggesting that leadership effects may be amplified or attenuated depending on the degree of task diversity [16]. Moreover, task variety has been shown to condition how individuals experience switching and engagement-related outcomes, implying that task structure influences the conversion of resources into behavior [17].

In the present framework, greater task variety may reduce employees' dependence on leader structuring for routine role enactment, as task-diverse jobs can cultivate autonomy and self-regulation. Conversely, higher task variety may increase the salience of boundary-oriented activity because diverse tasks often require broader information access and cross-boundary coordination. Accordingly, the indirect effect through ambidextrous leadership is expected to vary as a function of task variety, potentially weakening for role-congruent behavior and strengthening for boundary-oriented activity.

Hypothesis 8. Task variety moderates the indirect relationship between a leader's creative metacognition and employees' role-congruent behavior via ambidextrous leadership, such that the indirect effect is weaker when task variety is high.

Hypothesis 9. Task variety moderates the indirect relationship between a leader's creative metacognition and employees' boundary-oriented activity via ambidextrous leadership, such that the indirect effect is stronger when task variety is high.

3. Method

3.1. Research design and sample

The present study employed a cross-sectional survey design, using matched leader–member dyads, to examine the relationships among leaders' creative metacognition, ambidextrous leadership, employees' adaptive work behaviors, and task variety. Data were collected from employees and their immediate supervisors working in a range of public and private organizations. To reduce common method bias and perceptual contamination, leaders and employees completed separate questionnaires, and responses were matched at the team level.

A total of 250 teams were initially invited to participate in the study. After excluding cases with incomplete or unmatched responses, 222 leader–member dyads were retained for the final analysis, yielding a response rate of approximately 88.8%. Each leader was matched with one focal employee from the same team, following prior dyadic research practices in leadership studies. Participation was voluntary, and respondents were assured of anonymity and confidentiality.

The final leader sample consisted of individuals with diverse demographic characteristics and tenure levels, reflecting a range of managerial experience. Similarly, the employee sample included participants from various occupational roles, functional areas, and organizational tenures. The average team size reported by leaders was approximately 7 members, indicating that the focal employee was embedded within a broader team rather than in an isolated dyadic relationship.

3.2. Measures

All constructs were measured using previously validated scales. Unless otherwise indicated, items were rated on a Likert-type scale, and higher values indicated higher levels of the focal construct. To ensure conceptual clarity and measurement equivalence, minor wording adjustments were made to reflect organizational contexts, while preserving the original meaning of each item.

3.2.1. Creative metacognition

Leaders' creative metacognition was assessed as a self-regulatory cognitive capability related to creative problem solving. The measure captured leaders' perceived ability to recognize problems, generate ideas, evaluate alternatives, and regulate the implementation of creative solutions. Consistent with prior research, creative metacognition was treated as a higher-order construct encompassing multiple stages of creative cognition. After scale refinement, 28 items were used. Reliability and convergent validity indices indicated that the scale demonstrated satisfactory internal consistency and construct validity.

3.2.2. Ambidextrous leadership

Ambidextrous leadership was measured using a scale that captures both opening leadership behaviors (e.g., encouraging experimentation, allowing variation) and closing leadership behaviors (e.g., monitoring progress, enforcing rules). Leaders evaluated their own leadership behaviors. Following established practice in ambidextrous leadership research, the two dimensions were jointly modeled to capture leaders' capacity to flexibly alternate between exploratory and exploitative behaviors in response to situational demands. Reliability analyses indicated acceptable internal consistency for both subdimensions.

3.2.3. Role-congruent behavior

Employees' role-congruent behavior was measured as the extent to which they performed behaviors formally required by their job roles. The scale focused on task-related behaviors essential for maintaining coordination, reliability, and role fulfillment within the team. Employees provided self-reports of their role-congruent behavior. Internal consistency reliability for this scale met commonly accepted thresholds.

3.2.4. Boundary-oriented activity

Boundary-oriented activity was measured as employee behaviors involving interaction across organizational boundaries, including coordination with other units and engagement with external stakeholders. The scale included items measuring boundary-spanning, buffering, and reinforcing behaviors. Employees responded based on their typical work activities. The scale demonstrated satisfactory reliability and convergent validity, supporting its use as an indicator of adaptive boundary-related behavior.

3.2.5. Task variety

Task variety was measured as a job design characteristic reflecting the degree to which employees' work involved diverse tasks and required multiple skills. Employees evaluated their own task variety using a validated work design scale. Task variety was modeled as a moderator that conditions the indirect effects of leader creative metacognition on employee behaviors through ambidextrous leadership. Reliability and validity indicators were within acceptable ranges.

3.3. Control variables

To account for alternative explanations, several demographic variables were included as controls in the analyses. Specifically, leader gender, employee gender, leader age, and employee age were controlled, as these variables have been associated with leadership perceptions and work behavior in prior research. These variables were included in all relevant regression and conditional process analyses.

3.4. Analytical strategy

The hypotheses were tested using a combination of structural equation modeling and conditional process analysis. First, confirmatory factor analyses were conducted to assess the distinctiveness of the study constructs. Model fit was evaluated using multiple fit indices,

including the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR).

Second, direct and indirect effects were examined using regression-based mediation analysis with bootstrapping procedures. Indirect effects were evaluated using bias-corrected confidence intervals based on 5,000 resamples. Finally, moderated mediation hypotheses were tested by estimating conditional indirect effects at different levels of task variety. This analytical approach allows for simultaneous examination of mediation and moderation effects while maintaining statistical power and interpretability.

3.5 Summary of the methodological approach

In summary, the present study adopted a dyadic survey design, employed validated measurement instruments, and established analytical procedures to examine the proposed conditional process model. By separating data sources, incorporating control variables, and applying bootstrapped mediation and moderation analyses, the methodological approach was designed to provide a rigorous test of the theoretical framework developed in the preceding sections.

4. Results

4.1. Descriptive statistics and correlations

Table 1 reports the means, standard deviations, and Pearson correlation coefficients among the study variables. Leaders’ creative metacognition was positively correlated with ambidextrous leadership, role-congruent behavior, and boundary-oriented activity. Ambidextrous leadership also showed positive associations with both employee behavioral outcomes. Task variety was positively related to boundary-oriented activity, whereas its correlation with role-congruent behavior was comparatively weaker. Correlations among the focal variables were below commonly accepted thresholds for multicollinearity, suggesting that the variables were empirically distinguishable.

Table 1. Means, standard deviations, and correlations

Variable	Mean	SD	1	2	3	4	5
1. Creative Metacognition	—	—	—				
2. Ambidextrous Leadership	—	—	.**				
3. Role-Convergent Behavior	—	—	.**	.**			
4. Boundary-Oriented Activity	—	—	.**	.**	.**		
5. Task Variety	—	—	.**	.**	.	.**	

Note. $N = 222$. $p < .05$, $p < .01$. Control variables omitted for brevity.

4.2. Measurement model assessment

Confirmatory factor analyses were conducted to evaluate the adequacy of the measurement model. As shown in Table 2, the hypothesized multi-factor model demonstrated an acceptable fit to the data based on commonly used fit indices. All factor loadings were statistically significant and exceeded recommended minimum values. Composite reliability and average variance extracted values further supported convergent validity, while confidence interval comparisons indicated adequate discriminant validity among constructs.

Table 2. Measurement model fit indices

χ^2	df	CFI	TLI	IFI	RMSEA	SRMR
—	—	.90	.89	.90	.055	.049

Note. The values meet the commonly accepted criteria for acceptable model fit.

4.3. Tests of direct effects

Direct effects were examined using regression-based analyses while controlling for leader and employee gender and age. As shown in Table 3, creative metacognition was positively associated with ambidextrous leadership, supporting Hypothesis 1. Creative metacognition was also positively related to role-congruent behavior and boundary-oriented activity, supporting Hypotheses 2 and 3. In addition, ambidextrous leadership was positively associated with both employee behavioral outcomes, supporting Hypotheses 4 and 5.

Table 3. Direct effects of creative metacognition and ambidextrous leadership

Hypothesis	Path	B	SE	t	Result
H1	CM → AL	—	—	—	Supported
H2	CM → RB	—	—	—	Supported
H3	CM → BW	—	—	—	Supported
H4	AL → RB	—	—	—	Supported
H5	AL → BW	—	—	—	Supported

Note. CM = Creative Metacognition; AL = Ambidextrous Leadership; RB = Role-Convergent Behavior; BW = Boundary-Oriented Activity.

4.4. Mediation analysis

Mediation effects were tested using bootstrapped confidence intervals with 5,000 resamples. As presented in Table 4, ambidextrous leadership partially mediated the relationship between creative metacognition and role-congruent behavior. Similarly, ambidextrous leadership partially mediated the relationship between creative metacognition and boundary-oriented activity. In both cases, the confidence intervals for the indirect effects did not include zero, supporting Hypotheses 6 and 7.

Table 4. Mediating effects of ambidextrous leadership

Hypothesis	Path	Total Effect	Direct Effect	Indirect Effect	Result
H6	CM → AL → RB	—	—	—	Supported
H7	CM → AL → BW	—	—	—	Supported

4.5. Moderated mediation analysis

The conditional indirect effects were examined at low, medium, and high levels of task variety. Table 5 shows that the indirect effect of creative metacognition on role-congruent behavior via ambidextrous leadership decreased as task variety increased. The index of moderated mediation was statistically significant, supporting Hypothesis 8.

In contrast, Table 6 shows that the indirect effect on boundary-oriented activity increased with higher levels of task variety. The index of moderated mediation was statistically significant, supporting Hypothesis 9.

Table 5. Conditional indirect effects on role-convergent behavior

Task Variety Level	Indirect Effect	LLCI	ULCI
Low	—	—	—
Medium	—	—	—
High	—	—	—

Table 6. Conditional indirect effects on boundary-oriented activity

Task Variety Level	Indirect Effect	LLCI	ULCI
Low	—	—	—
Medium	—	—	—
High	—	—	—

4.6. Summary of results

Taken together, the results provide support for the proposed conditional process model. Leaders' creative metacognition was positively associated with ambidextrous leadership, which in turn was related to both role-congruent behavior and boundary-oriented activity. These indirect relationships varied systematically with task variety, indicating that leadership effects are contingent on job design characteristics.

5. Discussion

5.1. Summary of findings

The purpose of this study was to examine how leaders' creative metacognition relates to employee adaptive work behaviors through the enactment of ambidextrous leadership, and how these relationships are conditioned by task variety. The results provide consistent support for the proposed conditional process model. Specifically, leaders' creative metacognition was positively associated with ambidextrous leadership, which in turn was related to employees' role-congruent behavior and boundary-oriented activity. Moreover, ambidextrous leadership partially mediated the relationships between leader creative metacognition and both categories of employee behavior. These indirect effects were also found to vary with task variety, indicating the importance of job design as a contextual condition.

Taken together, the findings suggest that leader-level cognitive regulation capabilities, leadership behavioral enactment, and job characteristics jointly shape employee adaptive behaviors in organizational settings. Rather than operating as independent influences, these elements function as interrelated components of a broader adaptive process.

5.2. Theoretical implications

This study contributes to leadership and organizational behavior research in several respects. First, it extends ambidextrous leadership research by identifying creative metacognition as a cognitive antecedent that supports the enactment of leadership ambidexterity. While prior studies have predominantly focused on the outcomes or situational contingencies of ambidextrous leadership, relatively little attention has been paid to the cognitive capabilities that enable leaders to alternate between opening and closing behaviors flexibly. By positioning creative metacognition as a leadership-level self-regulatory capability, the present study offers a cognitively grounded perspective on how ambidextrous leadership may emerge in practice.

Second, the findings clarify the behavioral transmission mechanism linking leader cognition to employee outcomes. The results indicate that ambidextrous leadership partially mediates the relationship between creative metacognition and employee adaptive behaviors, suggesting that leader cognition does not directly translate into employee behavior without behavioral enactment at the leadership level. This supports process-oriented views of leadership, which emphasize that leadership effects unfold through observable leader behaviors rather than remaining at the level of internal cognitive states.

Third, this study contributes to the literature on employee adaptive behavior by jointly examining role-congruent behavior and boundary-oriented activity within a single framework. These behaviors represent complementary aspects of adaptation—internal reliability and external responsiveness—and are often examined in isolation. The present findings suggest that ambidextrous leadership can simultaneously support both forms of behavior, although the strength of these relationships depends on job design conditions. This integrated approach responds to recent calls for more nuanced conceptualizations of adaptive behavior in contemporary organizations.

Finally, by incorporating task variety as a moderator, the study bridges leadership research and work design perspectives. The results indicate that task variety conditions how leadership mechanisms operate, rather than simply exerting direct effects on behavior. This supports the view that leadership effectiveness cannot be fully understood without considering the structure of employees' work, and it underscores the value of adopting a contextualized approach to leadership theory.

5.3. Interpretation of the moderating effects of task variety

The moderated mediation findings provide further insight into the nature of leadership influence under different job conditions. When task variety was low, the indirect effect of creative metacognition on role-congruent behavior via ambidextrous leadership was stronger. This suggests that in relatively standardized or routine task environments, employees may rely more heavily on leader guidance to regulate their role performance, making ambidextrous leadership particularly salient for maintaining effective role enactment.

In contrast, as task variety increased, the indirect effect on role-congruent behavior weakened, whereas the indirect effect on boundary-oriented activity became stronger. One possible interpretation is that task-diverse jobs afford employees greater autonomy and self-regulatory capacity in core role performance, thereby reducing dependence on leader structuring. At the same time, higher task variety may increase the need for external information and coordination, amplifying the importance of leadership behaviors that legitimize and support boundary-oriented activity. These findings suggest that leadership ambidexterity may serve different adaptive functions depending on the structure of employees' work.

5.4. Practical implications

From a practical perspective, the findings suggest several implications for leadership development and job design. First, leadership development initiatives may benefit from incorporating training that enhances leaders' metacognitive awareness and self-regulation in creative problem solving. Rather than focusing solely on behavioral skills, such programs could emphasize reflective practices that help leaders monitor when exploration or exploitation is most appropriate.

Second, organizations should recognize that ambidextrous leadership is not uniformly effective across all work contexts. In settings characterized by low task variety, leaders may need to provide clearer guidance and structure to support effective role performance. Conversely, in high task-variety contexts, leaders may achieve greater impact by facilitating boundary-oriented activities, such as encouraging external collaboration and information exchange, while allowing employees greater discretion in role execution.

Finally, the findings underscore the importance of aligning leadership practices with job design. Adjustments to task structure and leadership behavior should be considered jointly, rather than as independent interventions, to support employee adaptation in dynamic environments.

5.5. Limitations and directions for future research

Several limitations should be acknowledged. First, the study's cross-sectional design limits the ability to draw strong causal inferences. Although the theoretical model is process-oriented, longitudinal or experimental designs would be required to examine temporal dynamics more directly. Second, the data were collected from a single national context, which may limit the generalizability of the findings. Cultural factors related to leadership and work behavior may influence the observed relationships.

Third, although efforts were made to reduce common method bias by separating data sources, some constructs relied on self-reports, which may be subject to perceptual bias. Future research could incorporate multi-source or behavioral measures. In addition, task variety was treated as a unidimensional construct; future studies may explore more fine-grained distinctions among task diversity types.

Future research could also examine additional cognitive antecedents of ambidextrous leadership, as well as alternative contextual moderators, such as team interdependence or environmental uncertainty. Such extensions would further clarify the conditions under which leadership cognition and behavior jointly contribute to employee adaptation.

In conclusion, this study highlights the importance of leader creative metacognition as a cognitive foundation for ambidextrous leadership. It demonstrates how leadership behavior and job design interact to shape employee adaptive work behaviors. By integrating cognitive, behavioral, and contextual perspectives, the study offers a nuanced understanding of leadership processes in contemporary organizations. Although the findings should be interpreted with appropriate caution, they suggest that adaptive leadership outcomes are best understood as the result of coordinated interactions among leader cognition, leadership behavior, and work characteristics.

6. Conclusion

The present study examined the relationships among leaders' creative metacognition, ambidextrous leadership, and employee adaptive work behaviors, while accounting for the moderating role of task variety. By adopting a conditional process perspective, the study sought to clarify how leader-level cognitive regulation is translated into employee behavior through leadership enactment under different job design conditions.

The findings indicate that leaders' creative metacognition is positively associated with ambidextrous leadership, which in turn is related to both role-congruent behavior and boundary-oriented activity. Ambidextrous leadership partially mediated these relationships, suggesting that leadership behavior serves as an important transmission mechanism linking leader cognition to employee adaptation. Moreover, the strength of these indirect

relationships varied depending on task variety, indicating that leadership influence operates differently across work contexts.

From a broader perspective, the results highlight that adaptive work behavior is best understood as an outcome of coordinated interactions among leader cognition, leadership behavior, and job design characteristics. Rather than treating leadership ambidexterity as a universally effective approach, the findings suggest that its role and relevance depend on the structure of employees' tasks and the behavioral demands of the work environment.

In conclusion, this study contributes to leadership research by integrating cognitive, behavioral, and contextual perspectives into a single explanatory framework. By clarifying the role of creative metacognition as a cognitive foundation for ambidextrous leadership and demonstrating how job design conditions leadership effects, the study provides a structured basis for future theoretical refinement in leadership and organizational behavior research.

Refereces

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