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Research paper

Neuroleadership Effects on Government Employee Performance: A Work Engagement Mediation Model

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Abstract

This study investigates how the quality of relationships between leaders and subordinates, neuroscience-informed leadership behaviors, and work ethic influence employee performance, with work engagement functioning as a mediating mechanism. Data were collected from 102 public employees in Medan, Indonesia, and analyzed using a variance-based structural equation modeling approach. The findings show that high-quality leader–subordinate relationships, neuroscience-informed leadership practices, and a strong work ethic each have a significant positive effect on employee performance. The results also reveal that leader–subordinate relationship quality and neuroscience-informed leadership enhance work engagement, whereas work ethic does not. Work engagement partially mediates the effects of leader–subordinate relationship quality and neuroscience-informed leadership on employee performance, but does not mediate the influence of work ethic. Overall, the study highlights the importance of relational leadership dynamics and neuroscience-informed leadership behaviors in strengthening work engagement and improving employee performance within the public sector.

Keywords: *leader–subordinate relationship quality, neuroscience-informed leadership, work ethic, work engagement, employee performance, public sector*

1. Introduction

Local governments play a fundamental role within modern public administration systems, functioning as key institutions responsible for delivering essential public services, coordinating development initiatives, and ensuring policy continuity at the regional level. Their performance is therefore central to the effectiveness, legitimacy, and responsiveness of the state (Andrews & Boyne, 2010; Pollitt & Bouckaert, 2017). At the organizational level, the work outcomes of civil servants directly influence how efficiently and equitably these services are delivered. In recent years, many governments have adopted digital performance monitoring systems—such as electronic performance appraisal platforms—to enhance transparency, strengthen accountability, and streamline evaluation processes (Brown et al., 2014; Kim and Beehr, 2020). However, despite these reforms, performance disparities remain evident across regional government agencies, suggesting the continued relevance of behavioral and psychological determinants in understanding public-sector performance variation (Meier & O'Meier and O'Toole, 2011; Walker et al., 2010).

Public administration scholarship emphasizes that employee performance is shaped not only by formal structures or administrative procedures but also by relational, motivational, and cognitive factors that influence employees' day-to-day work behavior (Rainey and Steinbauer, 1999; Caillier, 2020). Leader–Member Exchange (LMX) theory, originally developed by Graen and Uhl-Bien (1995), highlights that high-quality relationships between leaders and employees—characterized by trust, respect, and socio-emotional support—play a significant role in fostering engagement, discretionary effort, and improved performance (Martin et al., 2016; Rockstuhl et al., 2012). These relational dynamics are especially salient in bureaucratic systems where hierarchical distance and rigid procedures often constrain communication and limit opportunities for personalized leadership interactions (Fernandez and Moldogaziev, 2013).

Complementing relational leadership perspectives, the emerging field of neuroleadership incorporates insights from cognitive neuroscience to explain how leadership behaviors shape employees' cognitive, emotional, and motivational states (Waldman et al., 2011). Frameworks such as the SCARF model—emphasizing status, certainty, autonomy, relatedness, and fairness—demonstrate how leaders can activate approach-oriented behaviors and reduce psychological threat responses that impede performance (Rock, 2008; Balthazard et al., 2012; Boyatzis et al., 2014). Neuroleadership is particularly relevant in public organizations navigating reform and institutional complexity, where employees' psychological reactions to uncertainty often determine the success or failure of change initiatives.

Employee performance also reflects individual value orientations. Work ethic—defined as internalized values emphasizing diligence, responsibility, and moral duty—has been shown to improve task persistence, workplace reliability, and performance outcomes across public

and private organizations (Miller et al., 2002; Miller et al., 2002). However, scholars argue that values alone do not fully translate into behavioral outcomes without supportive psychological states. Work engagement, a motivational condition originally conceptualized by Kahn (1990) and characterized by vigor, dedication, and absorption, serves as an important bridge between leadership behaviors, personal values, and performance (Bakker & Demerouti, 2017; Schaufeli and Bakker, 2010). When employees experience high levels of engagement, they are more resilient, more committed to tasks, and more willing to contribute additional effort.

Despite strong theoretical foundations for the connections among LMX, neuroleadership, work ethic, work engagement, and performance, empirical research integrating these constructs within a unified explanatory model remains limited. Systematic reviews indicate that LMX research has grown substantially but remains fragmented, with limited application in public-sector contexts in developing administrative systems (Dulebohn et al., 2012). Neuroleadership research, while rapidly expanding, lacks empirical validation in government institutions and is often criticized for its limited operationalization in real organizational settings (Waldman et al., 2011). Similarly, studies examining work ethic and engagement in the public sector often treat these constructs independently, overlooking how they interact with leadership and cognitive mechanisms to shape performance outcomes (Caillier, 2020).

Furthermore, public-sector organizations in developing regions are characterized by unique structural challenges—including high hierarchical formality, limited autonomy, and resource constraints—that require tailored theoretical models rather than direct application of private-sector frameworks (Rainey and Steinbauer, 1999; Lewis & Frank, 2002). Yet research exploring the combined effects of relational leadership, neurocognitive responses, and work values within these contexts remains scarce.

To address these gaps, this study develops and empirically tests an integrated model linking Leader–Member Exchange, neuroleadership, and work ethic to employee performance, with work engagement serving as a mediating mechanism. By focusing on civil servants within a regional government environment, the study contributes to theory by unifying relational, neuroscience-informed, and value-based perspectives into a comprehensive explanation of public-sector performance. Practically, the findings offer strategic insights for public leaders seeking to enhance performance through relational and cognitive pathways, promoting psychologically healthy and intrinsically motivated workforces capable of meeting evolving governance challenges. These improvements have direct implications for service delivery efficiency and resource utilization in public administration.

2. Literature Review

2.1. Employee Performance

Employee performance is widely recognized as a multidimensional construct reflecting the extent to which employees contribute to organizational goals through task execution, behavioral effectiveness, and discretionary effort (Borman & Motowidlo, 1997; Campbell & Wiernik, 2015). In public-sector contexts, performance encompasses both the quality and timeliness of service delivery, as well as compliance with administrative standards that support organizational accountability (Rainey and Steinbauer, 1999; Meier & O'Meier and O'Toole, 2011). Research shows that employee performance in government settings is influenced by structural arrangements, leadership behavior, organizational climate, and psychological states such as motivation and engagement (Fernandez & Pitts, 2011; Saks, 2006; Caillier, 2020). Given that public-sector organizations typically operate under formalized procedures and resource constraints, performance tends to rely heavily on the internal psychological resources of employees and the leadership styles that shape these states. This study positions performance as the ultimate behavioral outcome shaped by relational, neurocognitive, and value-driven mechanisms.

2.2. Work Engagement

Work engagement is defined as a positive, fulfilling, and motivational state characterized by vigor, dedication, and absorption (Schaufeli & Bakker, 2010; Bakker & Albrecht, 2018). The Job Demands–Resources (JD–R) theory posits that engagement emerges when employees experience sufficient job resources—including autonomy, support, meaningful feedback, and effective leadership—to sustain motivation (Crawford et al., 2010; Bakker & Demerouti, 2017). Empirical studies demonstrate that engaged employees exhibit greater resilience, higher creativity, better citizenship behavior, and improved task performance (Christian et al., 2011; Halbesleben, 2010; Breevaart et al., 2014). In public organizations, engagement plays a particularly strong role due to structural constraints; when job resources are limited, employees rely more heavily on intrinsic motivation and relational support (Caillier, 2020). Thus, work engagement serves as a mediating psychological mechanism through which leadership and work values translate into enhanced performance. It provides a bridge between external cues (e.g., leadership behaviors) and internalized commitment to public service.

2.3. Leader–Member Exchange (LMX)

Leader–Member Exchange theory conceptualizes leadership as a relational process in which leaders develop differentiated relationships with subordinates, forming high-quality exchanges with some employees and more transactional exchanges with others (Liden et al., 2006). High-quality LMX relationships are characterized by trust, respect, reciprocity, and socio-emotional support, which contribute to employee motivation and commitment (Martin et al., 2016). Meta-analytic findings reveal that LMX strongly predicts job satisfaction, organizational commitment, engagement, and performance outcomes across cultural contexts (Rockstuhl et al., 2012). In hierarchical public-sector environments, where formal authority structures often create distance between leaders and subordinates, LMX plays an even more critical role in shaping psychological safety, empowerment, and extra-role behavior (Fernandez and Moldogaziev, 2013). Through the social exchange mechanism (Blau, 1964), employees reciprocate high-quality relationships with greater performance and engagement. LMX, therefore, represents a key relational resource that influences employees' cognitive and motivational states.

2.4. Neuroleadership

Neuroleadership represents an emerging interdisciplinary field that integrates insights from neuroscience to understand how leadership behaviors influence employees' brain-based cognitive and emotional processes (Waldman et al., 2011). A central framework in neuroleadership is the SCARF model, which proposes that individuals' social behaviors are shaped by responses to five primary domains: status, certainty, autonomy, relatedness, and fairness (Rock, 2008). When leaders foster conditions that enhance certainty, fairness, and autonomy, employees experience reduced threat activation in neural circuits associated with stress and heightened activation in reward pathways (Boyatzis & Mc). These neurocognitive responses translate into greater intrinsic motivation, engagement, openness to change, and

performance. While neuroleadership research remains conceptually promising, empirical studies in public-sector environments are still limited (Waldman et al., 2011; Lindebaum & Zundel, 2013). Integrating neuroleadership with LMX provides a comprehensive understanding of how leadership affects both relational and cognitive pathways, producing compounded effects on work engagement and performance.

2.5. Work Ethic

Work ethic refers to a set of internalized beliefs emphasizing diligence, responsibility, self-discipline, reliability, and moral conduct (Miller et al., 2002; Meriac et al., 2010). Unlike extrinsic incentives, work ethic represents a deeply held personal value that shapes employees' long-term commitment to their roles. Research consistently shows that employees with a strong work ethic exhibit greater task persistence, higher productivity, lower absenteeism, and stronger motivation (Miller et al., 2002). In public organizations, work ethic is particularly important due to the presence of bureaucratic procedures and limited performance-based rewards. Employees who possess a strong work ethic demonstrate greater goal orientation and are more likely to sustain engagement even under operational constraints (Perry & Wise, 1990; Benkhoff, 1997). Work ethic also enhances intrinsic motivation, which in turn fosters higher levels of engagement and improved performance. Thus, work ethic serves as an internal personal resource within the JD–R framework that influences how employees respond to leadership behaviors and job demands.

2.6. Integrating LMX, Neuroleadership, Work Ethic, and Engagement

Emerging research suggests that relational, cognitive, and value-based mechanisms jointly shape employee performance. High-quality LMX relationships enable leaders to fulfill employees' psychological needs for support and recognition, facilitating positive emotional states that promote engagement (Breevaart et al., 2014). Meanwhile, neuroleadership complements relational leadership by explaining how leaders influence employees' threat–reward neural responses, which further strengthen motivation, openness, and performance (Waldman et al., 2011). Work ethic contributes an additional internal resource, shaping employees' intrinsic motivation and commitment to public service (Miller et al., 2002). Together, these constructs provide a comprehensive theoretical framework for understanding performance in public-sector environments. However, empirical integration of these perspectives remains sparse. Most studies examine leadership, engagement, or work ethic independently, without capturing their combined influence within complex organizational systems. Moreover, existing neuroleadership research is predominantly theoretical, with limited application to government institutions or relational frameworks such as LMX (Dulebohn et al., 2012). Similarly, studies in public-sector performance often overlook how cognitive responses interact with relational and value-based mechanisms. This study addresses these gaps by integrating LMX, neuroleadership, work ethic, and work engagement into a unified model to explain civil servant performance in a regional government setting.

2.7. Hypothesis Development

Leader–Member Exchange theory posits that leaders develop differentiated relationships with subordinates, generating high-quality exchanges characterized by trust, reciprocity, respect, and socio-emotional support (Liden et al., 2006; Martin et al., 2016). High LMX relationships enhance psychological safety, empower employees, and reduce ambiguity, resulting in increased motivation and higher-quality work outputs (Rockstuhl et al., 2012). Research consistently shows that LMX positively affects engagement and performance through mechanisms of social exchange and relational support (Breevaart et al., 2014).

H1: Leader–Member Exchange has a positive effect on employee performance.
H2: Leader–Member Exchange has a positive effect on work engagement.

Neuroleadership applies insights from cognitive neuroscience to explain how leadership behaviors shape employees' emotional and cognitive responses (Waldman et al., 2011). Through the SCARF model—status, certainty, autonomy, relatedness, and fairness—leaders can activate reward pathways while reducing threat responses in employees' neural processing (Rock, 2008). Such conditions enhance intrinsic motivation, openness, and energy at work (Boyatzis et al., 2012). This suggests that neuroleadership improves engagement by stimulating psychological safety and high-quality interpersonal interactions.

H3: Neuroleadership has a positive effect on employee performance.
H4: Neuroleadership has a positive effect on work engagement.

Work ethic reflects internalized values emphasizing diligence, responsibility, perseverance, and moral discipline (Miller et al., 2002). Employees with a strong work ethic demonstrate higher reliability, stronger goal orientation, and a willingness to exert effort that exceeds formal job requirements (Miller et al., 2002). Work ethic has been shown to predict task performance and is strongly associated with higher engagement because employees with strong value orientation derive deeper meaning from their work.

H5: Work ethic has a positive effect on employee performance.
H6: Work ethic has a positive effect on work engagement.

Work engagement is a motivational state characterized by vigor, dedication, and absorption (Schaufeli and Bakker, 2010). According to the Job Demands–Resources theory, engagement acts as a key pathway through which job resources and personal resources influence performance (Bakker & Demerouti, 2017; Rich et al., 2010). Engaged employees exhibit greater persistence, energy, and cognitive involvement, leading to superior performance outcomes across sectors (Christian et al., 2011).

H7: Work engagement has a positive effect on employee performance.

Work engagement plays a central role in translating leadership behaviors and personal values into performance. High-quality LMX relationships foster emotional and motivational resources that directly enhance engagement (Breevaart et al., 2014). Neuroleadership improves engagement by activating neural mechanisms associated with reward and reducing perceived threat (Waldman et al., 2011). Additionally,

a strong work ethic stimulates deeper psychological involvement in work, which manifests as greater engagement (Miller et al., 2002). Consequently, engagement is expected to mediate the influence of LMX, neuroleadership, and work ethic on performance.

H8: Work engagement mediates the effect of Leader–Member Exchange on employee performance.
H9: Work engagement mediates the effect of neuroleadership on employee performance.
H10: Work engagement mediates the effect of work ethic on employee performance.

3. Methods

3.1. Research design

This study employed a quantitative, explanatory research design to test the proposed structural relationships among Leader–Member Exchange, neuroleadership, work ethic, work engagement, and employee performance. The design is appropriate for theory testing and examining causal pathways in a mediated model, especially within public-sector contexts where psychological and relational mechanisms are critical for explaining performance outcomes. Partial Least Squares Structural Equation Modeling (PLS-SEM) was selected due to its suitability for complex models, predictive orientation, and its robustness with non-normal data (Hair et al., 2021). This approach aligns with prior leadership and public administration research examining multi-construct frameworks involving psychological mediators (Waldman et al., 2011; Caillier, 2020).

3.2. Population and sampling

The target population consisted of civil servants working in regional government institutions in Medan, Indonesia. A purposive sampling technique was used to ensure that all selected participants met the required criteria, namely full-time civil servant status and direct involvement in administrative or public service functions. A total of 102 respondents participated in the study. Although the sample size was smaller than typical probability-based designs, it satisfies the minimum requirements for variance-based structural equation modeling. Following the ten-times rule and contemporary recommendations for Partial Least Squares Structural Equation Modeling (PLS-SEM), a minimum sample of 60–80 respondents is considered adequate for a model with the present level of complexity (Hair et al., 2021). Therefore, the final sample of 102 respondents provides sufficient statistical power for estimating direct and indirect effects within the structural model.

3.3. Data Collection Procedure

Data were collected using a structured self-administered questionnaire distributed electronically to civil servants across different regional government units. Respondents completed the survey voluntarily and anonymously to reduce social desirability bias (Podsakoff et al., 2012). The questionnaire included screening items to ensure eligibility (full-time civil servant status and a minimum of six months of tenure). Before full deployment, the instrument underwent a pilot test with 30 participants to evaluate clarity, reliability, and item comprehension. Minor adjustments were made to wording and formatting based on participant feedback and expert review. To address potential common method bias, respondent anonymity was ensured, and Harman's single-factor test was conducted. All items were loaded into an unrotated exploratory factor analysis. The first factor accounted for 34.7% of total variance, below the 50% threshold (Podsakoff et al., 2012), indicating that common method bias does not substantially threaten validity.

3.4. Measures and Instruments

All study variables were assessed using established measurement scales drawn from prior research and rated on a five-point Likert continuum (1 = strongly disagree, 5 = strongly agree). Leader–Member Exchange (LMX) was measured with items from Liden et al. (2006), representing the quality of leader–subordinate relationships, including trust, respect, and mutual obligation. Neuroleadership followed the SCARF-based indicators developed by Rock (2008) and later empirical applications by Waldman et al. (2011), capturing perceptions of status, certainty, autonomy, relatedness, and fairness conveyed by leaders. Work ethic relied on items adapted from Miller et al. (2002), reflecting diligence, responsibility, and the intrinsic value placed on work. Work engagement was assessed using the Utrecht Work Engagement Scale (UWES), which evaluates vigor, dedication, and absorption (Schaufeli and Bakker, 2010). Employee performance incorporated both task and contextual dimensions using measures derived from Campbell and Wiernik (2015) and validated in public-sector environments by Caillier (2020). All scales have consistently shown strong psychometric quality in prior studies, supporting their suitability for the present research.

3.5. Data analysis

The empirical data were analyzed using SmartPLS 4.0. PLS-SEM analysis followed the two-stage approach recommended by international The measurement model was evaluated following established PLS-SEM procedures (Hair et al., 2021). Reliability was assessed through Cronbach's alpha and composite reliability (values > 0.70 indicating acceptable internal consistency). Convergent validity was evaluated using Average Variance Extracted (AVE), with all constructs expected to exceed the minimum threshold of 0.50. Outer loadings below 0.70 were examined for potential removal, subject to theoretical consistency and contribution to construct validity. Discriminant validity was examined using the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT). All constructs were expected to demonstrate satisfactory discriminant separation. After validating the measurement model, the structural paths were tested using bootstrapping with 5,000 subsamples to obtain robust estimates of standard errors and significance levels. Model explanatory power was assessed using R^2 values for work engagement and employee performance, while predictive relevance was evaluated using Q^2. Indirect effects for the mediating role of work engagement were examined using bias-corrected confidence intervals. Effect sizes (f^2) were calculated to determine the magnitude of each predictor's contribution to the endogenous constructs.

4. Results

4.1. Respondent Characteristics

The descriptive characteristics of the respondents were analyzed to provide an overview of the sample distribution across gender, age groups, education levels, and organizational divisions. Table 1 summarizes the demographic composition of the 102 employees who participated in the study.

Table 1. Respondent Characteristics (n = 102)

Category	Sub-category	Frequency	Percentage (%)
Gender	Male	60	58.82
	Female	42	41.18
Age	20–30 years old	26	25.49
	31–41 years old	44	43.14
	>41 years old	32	31.37
Education Level	Senior High School	9	8.82
	Bachelor's Degree (S1)	76	74.51
	Master's Degree (S2)	17	16.67
Division	Employee Welfare and Transfer	30	29.41
	Career Development	25	24.51
	Employee Data Procurement	18	17.65
	Human Resource Development	29	28.43
Total Respondents		**102**	**100.00**

As shown in Table 1, the sample is relatively balanced across demographic categories. The gender distribution indicates a slight predominance of male respondents. Most employees are in the productive age range of 31–41 years, and the majority hold a bachelor's degree, reflecting a generally well-educated workforce. In terms of organizational placement, respondents are distributed across four key divisions, with no single division dominating the sample. Overall, the demographic profile suggests a diverse and representative workforce, supporting the robustness of subsequent analyses.

4.2. Measurement model assessment

To evaluate the adequacy of the reflective measurement model, indicator reliability, internal consistency reliability, and convergent validity were assessed. Table 2 presents the complete measurement model results, including outer loadings for all indicators, along with the corresponding Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE) values for each construct.

Table 2: Measurement Model Assessment

Construct	Item Code	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Leader–Member Exchange	LM.1	0.770	**0.952**	**0.958**	**0.657**
	LM.2	0.777			
	LM.3	0.741			
	LM.4	0.767			
	LM.5	0.816			
	LM.6	0.847			
	LM.7	0.853			
	LM.8	0.842			
	LM.9	0.852			
	LM.10	0.831			
	LM.11	0.806			
	LM.12	0.813			
Neuroleadership	NL.1	0.800	**0.962**	**0.966**	**0.706**
	NL.2	0.841			
	NL.3	0.856			
	NL.4	0.859			
	NL.5	0.835			
	NL.6	0.873			
	NL.7	0.862			
	NL.8	0.838			
	NL.9	0.849			
	NL.10	0.822			
	NL.11	0.813			
	NL.12	0.831			
Work Ethic	WE.1	0.884	**0.970**	**0.973**	**0.753**
	WE.2	0.883			
	WE.3	0.893			
	WE.4	0.878			
	WE.5	0.895			
	WE.6	0.831			
	WE.7	0.878			
	WE.8	0.866			
	WE.9	0.806			
	WE.10	0.832			
	WE.11	0.882			
	WE.12	0.879			
Work Engagement	WEG.1	0.884	**0.966**	**0.970**	**0.729**

	WEG.2	0.854			
	WEG.3	0.870			
	WEG.4	0.872			
	WEG.5	0.823			
	WEG.6	0.881			
	WEG.7	0.870			
	WEG.8	0.882			
	WEG.9	0.868			
	WEG.10	0.775			
	WEG.11	0.838			
	WEG.12	0.825			
Employee Performance	EP.1	0.841	**0.964**	**0.967**	**0.623**
	EP.2	0.850			
	EP.3	0.742			
	EP.10	0.766			
	EP.11	0.820			
	EP.12	0.791			
	EP.13	0.772			
	EP.14	0.807			
	EP.15	0.820			
	EP.16	0.768			
	EP.17	0.741			
	EP.18	0.787			

As presented in Table 2, all items meet the recommended outer loading threshold (>0.50), confirming satisfactory indicator reliability (Hair et al., 2017). Additionally, all constructs demonstrate strong internal consistency, with Cronbach's Alpha and Composite Reliability values exceeding 0.70. The AVE values for each construct also surpass the recommended benchmark of 0.50, indicating adequate convergent validity across all latent variables. Discriminant validity was assessed using the Fornell–Larcker criterion and the HTMT to ensure that each construct is empirically distinct from the others. Table 3 presents the results for both criteria across all latent variables.

Table 3: Discriminant Validity Assessment

Panel A. Fornell–Larcker Criterion

Construct	EP	LMX	NL	WE	WEth
Employee Performance (EP)	**0.790**				
Leader–Member Exchange (LMX)	0.440	**0.810**			
Neuroleadership (NL)	0.576	0.175	**0.840**		
Work Engagement (WE)	0.756	0.468	0.630	**0.854**	
Work Ethic (WEth)	0.599	0.129	0.217	0.312	**0.868**

Note: *Diagonal values represent √AVE.*

Panel B. Heterotrait–Monotrait Ratio (HTMT)

Construct	EP	LMX	NL	WE	WEth
Employee Performance (EP)	—	0.514	0.684	0.812	0.676
Leader–Member Exchange (LMX)	0.514	—	0.242	0.551	0.198
Neuroleadership (NL)	0.684	0.242	—	0.703	0.276
Work Engagement (WE)	0.812	0.551	0.703	—	0.361
Work Ethic (WEth)	0.676	0.198	0.276	0.361	—

Note: *All HTMT values are below 0.85, supporting discriminant validity.*

As shown in Table 3, the square root of the AVE for each construct exceeds its correlations with other constructs, satisfying the Fornell–Larcker criterion. Likewise, all HTMT values fall below the recommended threshold of 0.85, providing strong evidence of discriminant validity and confirming that the constructs are sufficiently distinct within the model.

4.3. Structural model evaluation

To assess the explanatory power and predictive relevance of the structural model, the R-square (R^2), adjusted R-square, and Stone–Geisser's Q^2 values were examined for each endogenous construct. Table 4 presents the summary of these results.

Table 4: Structural Model Results

Construct	R^2	Adjusted R^2	Q^2 (Predictive Relevance)
Employee Performance	0.747	0.737	0.512
Work Engagement	0.550	0.536	0.384

As shown in Table 4, the structural model demonstrates substantial explanatory power for Employee Performance and moderate explanatory power for Work Engagement. Furthermore, all Q^2 values exceed the recommended threshold of zero, indicating that the model possesses meaningful predictive relevance and adequate out-of-sample prediction capability. To provide a comprehensive evaluation of the structural model, Table 5 presents the results of the direct effects, indirect (mediated) effects, and the corresponding effect sizes (f^2) for all hypothesized relationships.

Table 5: Structural Model Summary

Path / Mediated Path	β	t-value	p-value	f^2	Remarks
Direct Effects					
LMX → EP	0.147	2.308	0.021	0.030	Significant (small effect)
NL → EP	0.182	2.143	0.033	0.045	Significant (small–medium effect)
WE → EP	0.400	4.717	0.000	0.210	Significant (medium effect)
LMX → WEG	0.355	4.856	0.000	0.170	Significant (medium effect)
NL → WEG	0.535	7.136	0.000	0.320	Significant (large effect)

WE → WEG	0.150	1.682	0.093	0.015	Not significant (very small effect)
WEG → EP	0.447	3.809	0.000	0.255	Significant (medium–large effect)
Indirect Effects (Mediation)					
LMX → WEG → EP	0.159	2.708	0.007	—	Partial mediation
NL → WEG → EP	0.239	3.687	0.000	—	Partial mediation
WE → WEG → EP	0.067	1.369	0.172	—	No mediation

As presented in Table 5, most hypothesized direct effects are significant, with neuroleadership and work ethic showing the strongest influence on employee performance. The effect size estimates further indicate that neuroleadership exerts a large effect on work engagement, while work engagement itself demonstrates a substantial contribution to employee performance. The mediation analysis reveals partial mediation for leader–member exchange and neuroleadership, whereas work ethic does not exhibit a significant indirect effect through work engagement. To evaluate the overall quality of the model, several global fit indices commonly used in PLS-SEM were examined, including SRMR, NFI, chi-square, and RMS Theta. Table 6 presents the complete model fit summary.

Table 6: Model Fit Summary

Fit Index	Value	Threshold	Remarks
SRMR	**0.058**	< 0.08 (good)	Good model fit
d_ULS	0.923	Closer to 0 is better	Within an acceptable range
d_G	0.512	Closer to 0 is better	Acceptable
Chi-Square (Saturated Model)	1,248.37	—	Reported value
Chi-Square (Estimated Model)	1,315.44	—	Reported value
NFI (Normed Fit Index)	**0.912**	> 0.90 (good)	Good fit
RMS Theta	**0.102**	< 0.12 (good for reflective models)	Acceptable

As shown in Table 6, the model demonstrates a good overall fit. The SRMR value of 0.058 falls below the recommended threshold of 0.08, indicating an acceptable level of residual differences between the observed and predicted correlations. The NFI value exceeds the 0.90 benchmark, reflecting strong comparative model fit. Additionally, RMS Theta remains below the cutoff of 0.12, confirming that the reflective measurement model does not exhibit substantial misspecification.

5. Discussion

This study explored how relational leadership, neuroscience-informed leadership behaviors, and value-based orientations jointly influence employee performance in a governmental context, with work engagement serving as a central psychological mechanism. The findings provide an integrated understanding of how leaders shape employees' cognitive, emotional, and behavioral functioning in bureaucratic environments. The results show that Leader–Member Exchange (LMX) significantly enhances both work engagement and employee performance. This is consistent with extensive meta-analytic research demonstrating that high-quality leader–follower relationships cultivate trust, socioemotional support, and psychological safety—factors that improve motivation and task effectiveness (Martin et al., 2016; Rockstuhl et al., 2012). Within rigid public-sector structures, relational leadership becomes an essential resource that reduces ambiguity, enhances clarity, and strengthens employees' readiness to perform. The partial mediation through engagement reinforces Social Exchange Theory (Cropanzano & Mitchell, 2005), suggesting that employees reciprocate supportive leadership by investing cognitive and emotional energy into their work (Schaufeli and Bakker, 2010). Neuroleadership also emerged as a strong predictor of engagement and performance, lending empirical support to the SCARF model (Rock, 2008). Leaders who reduce social threats and increase perceptions of fairness, certainty, and autonomy activate reward-related neural pathways that enhance motivation, emotional stability, and openness to task focus (Boyatzis et al., 2012; Jack et al., 2019). This mechanism is especially relevant in public-sector settings, where procedural complexity and role pressure frequently trigger cognitive strain. The partial mediation pattern indicates that neuroleadership influences performance through both immediate motivational signaling and longer-term psychological activation. Work ethic demonstrated a substantial direct influence on employee performance but did not significantly predict engagement. This suggests that work ethic functions primarily as a behavioral–normative mechanism rather than an affective–motivational one. Employees with strong internalized work values exhibit reliability, discipline, and persistence regardless of emotional fluctuations (Miller et al., 2002; Miller et al., 2002). Given the bureaucratic constraints of public organizations, performance may rely more heavily on stable internal values than on momentary psychological states, explaining why work ethic enhances performance directly but not through engagement. Work engagement itself proved to be a critical pathway linking leadership behaviors to performance outcomes, consistent with the Job Demands–Resources (JD–R) framework (Bakker & Demerouti, 2017). Engaged employees demonstrate higher levels of vigor, dedication, and absorption, which translate into stronger performance (Fredrickson, 2001; Christian et al., 2011). The results reaffirm that leadership serves as a primary job resource in environments where material and structural resources are limited (Caillier, 2020). Engagement amplifies the impact of leadership by transforming relational and cognitive cues into sustained effort and resilience (MacLeod & Clarke, 2009). Taken together, the findings indicate that public-sector performance arises from the interplay of relational support (LMX), cognitive–emotional regulation (neuroleadership), and internalized values (work ethic). This integrated model extends existing theories by highlighting that performance is not driven by a single mechanism but by the convergence of psychological, neuroscientific, and value-based pathways. It reinforces the view that leadership in government institutions is not merely administrative but fundamentally relational and psychological, shaping both employees' mental states and their behavioral patterns.

5.1. Theoretical Implications

This study makes several theoretical contributions. First, it integrates relational leadership (LMX), neuroleadership, and work ethic into a unified explanatory model, addressing long-standing calls for interdisciplinary leadership frameworks that incorporate social, cognitive, and value-driven mechanisms (Ashkanasy et al., 2014; Becker et al., 2011). The results demonstrate that leadership effectiveness in public-sector organizations arises from both relational exchanges and cognitive–emotional processes, providing a multi-layered understanding of how leadership influences performance. Second, the study advances neuroleadership theory by offering empirical evidence from a governmental setting—an environment rarely examined in neuroscientific leadership research. The strong influence of neuroleadership on engagement and performance validates the SCARF model's propositions and underscores the importance of neurocognitive mechanisms in public organizations burdened by uncertainty and procedural constraints. Third, the findings refine engagement theory by showing that

leadership-driven antecedents affect engagement, whereas value-driven antecedents such as work ethic do not. This distinction suggests that engagement is particularly sensitive to relational and cognitive resources rather than to normative personal values (Macey & Schneider, 2008), offering conceptual clarity regarding the scope and boundaries of engagement as a mediating construct. Finally, the study contributes to public administration theory by demonstrating that performance is shaped not only by structures and incentives but also by neural, psychological, and relational processes. This reinforces the shift toward behavioral public management, positioning leadership as a psychological practice that meaningfully shapes employee behavior in bureaucratic contexts.

5.2. Practical and Managerial Implications

The findings have significant implications for leadership development and performance management in public institutions. First, government leaders should prioritize building high-quality relational exchanges with subordinates through open communication, trust-building, and socioemotional support. These relational practices enhance engagement and performance even in highly formalized environments. Second, leadership training programs should incorporate neuroleadership principles, including emotional regulation, fairness-based decision-making, clarity enhancement, and threat-reduction behaviors. These cognitive–emotional leadership practices reduce stress, increase certainty, and promote psychological safety—key drivers of engagement and performance. Third, organizations should reinforce a work ethic through value-based recruitment, mentoring, and socialization processes. Because work ethic operates independently of psychological engagement, strengthening value orientation helps maintain performance consistency across varying emotional states. Fourth, engagement-enhancing practices—such as feedback, empowerment, recognition, and autonomy support—should be embedded directly into daily leadership interactions rather than implemented as isolated HR interventions (Shuck & Wollard, 2010). Finally, the results highlight the need for a dual strategy: strengthening leaders' relational and cognitive capabilities while simultaneously cultivating employees' internal values. Structural reforms alone will be insufficient without strengthening these behavioral and psychological mechanisms (Truss et al., 2013).

5.3. Limitations and future research directions

Several limitations should be acknowledged. First, the cross-sectional design limits causal interpretation. Future studies should employ longitudinal or multi-wave methods to examine how leadership signals, psychological states, and performance evolve. Second, reliance on self-report data may introduce perceptual biases; incorporating supervisor evaluations, objective indicators, or multi-method approaches (e.g., experience sampling) would improve measurement validity. Third, the study was conducted within a single regional government agency, limiting generalizability. Comparative studies across different governmental levels or across countries could provide a more nuanced understanding of contextual influences. Fourth, while SCARF-based measures capture key aspects of neuroleadership, future research could integrate physiological or neurological indicators (e.g., EEG, HRV, cortisol) to enhance construct validity and move toward true organizational neuroscience. The single-region (Medan) and single-sector focus limit transferability to other geographic, governmental, or organizational contexts. Finally, future research should examine moderating factors such as organizational politics, public service motivation, psychological safety (Newman et al., 2017), digital maturity, or job autonomy. Researchers might also expand the model by incorporating constructs such as resilience (Luthans & Youssef, 2007), affective commitment, or perceived organizational support. Experimental or intervention-based designs evaluating neuroleadership and LMX training programs would yield valuable insights into causal mechanisms and practical implementation.

6. Conclusion

This study provides a comprehensive explanation of how relational, neurocognitive, and value-driven mechanisms jointly shape employee performance in a public-sector context. By examining Leader–Member Exchange (LMX), neuroleadership, and work ethic simultaneously, and by establishing work engagement as a mediating mechanism, the study demonstrates that employee performance emerges not from a single antecedent but from the interaction of relational support, cognitive–emotional regulation, and internalized work values. The findings confirm that LMX and neuroleadership simultaneously activate direct behavioral pathways and indirect motivational pathways through engagement, while work ethic exerts a stable direct influence independent of psychological activation. This differentiation enriches theoretical discussions by clarifying how leadership-based and value-based predictors operate through distinct mechanisms. Work engagement is shown to be a pivotal psychological state that channels leadership practices into improved performance, consistent with the Job Demands–Resources framework. The substantial effects of neuroleadership highlight the growing relevance of cognitive-neuroscientific leadership principles in bureaucratic environments where uncertainty, procedural rigidity, and job pressure are prevalent. Meanwhile, the strong direct role of work ethic underscores the importance of intrinsic value systems as behavioral anchors capable of sustaining performance regardless of affective fluctuations. Practically, the findings suggest that leadership development in the public sector should encompass both relational competencies and neuroscience-informed behaviors—such as emotional regulation, fairness, predictability, and autonomy-supportive communication. Strengthening work ethic through value-oriented recruitment and socialization can further ensure consistent performance. Together, these strategies provide public institutions with pathways for enhancing performance without relying solely on structural reforms or extrinsic incentives. Overall, this study advances the understanding of performance in government institutions by showing that effective leadership must simultaneously engage the relational, cognitive, and moral dimensions of employee functioning. By integrating these perspectives within a single empirical model, the study offers a more holistic foundation for future research and practical reform aimed at building psychologically healthy, resilient, and high-performing public-sector workforces.

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