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Transformational Leadership and Driving Performance at the National Transportation Safety Committee: The Mediating Effects of Engagement and Motivation

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Abstract

This study investigates how transformational leadership affects employee performance at the National Transportation Safety Committee (NTSC), focusing on the mediating roles of work engagement and work motivation. A census method was employed, and data were analyzed using structural equation modeling (SEM) based on responses from all 107 NTSC employees in Indonesia. Primary data were collected through a detailed questionnaire covering the entire employee population to ensure comprehensive representation. The findings reveal that transformational leadership positively and significantly influences work engagement, work motivation, and employee performance. Additionally, both work engagement and work motivation significantly enhance employee performance. Mediation analysis indicates that work engagement and work motivation partially mediate the relationship between transformational leadership and employee performance. This study contributes new insights and supports existing literature on transformational leadership, work engagement, work motivation, and employee performance within the NTSC. It recommends that NTSC management clearly communicate the organization's vision and mission, implement improvements in operational standards to enhance organizational value, and develop policies aligned with the NTSC's strategic objectives.

Keywords: National Transportation Safety Committee, Work engagement, Transformational leadership, Employee performance, Work motivation

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Introduction

The effectiveness of a nation's transportation safety system largely depends on the performance of its oversight institutions [1]. In Indonesia, the National Transportation Safety Committee (NTSC) plays a central role in this domain [2]. In 2021, transportation incidents, particularly in the maritime sector, surged, with a notable increase in fishing boat accidents [3], highlighting potential systemic weaknesses within the NTSC and signaling an urgent need for action. The aviation sector also faced significant challenges, most notably the crash of a commercial aircraft shortly after departing Soekarno-Hatta International Airport [4]. These events underscore the importance of investigating employee performance at the NTSC, as it directly impacts national transportation safety outcomes.

Examining the factors affecting NTSC employees is critical because employee performance is a key driver of organizational success across both public and private sectors [5]. As emphasized by Mariappanadar [6], human resources are the most vital asset in an organization, even surpassing financial or technological resources, because advanced technologies and equipment



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are ineffective without skilled personnel to utilize and maintain them. Employees, when fully engaged and motivated, can exceed organizational expectations, making leadership a pivotal factor.

Transformational leadership, defined by Manoppo [7] as “a leadership style that inspires followers to surpass self-interest by transforming their morals, ideals, and values, motivating them to perform beyond expectations,” plays a critical role in shaping employee performance [8]. Equally important is work engagement, which represents an employee’s active involvement in their work. Work engagement is characterized as a positive, fulfilling, work-related state of mind marked by vigor (high energy and effort), dedication (active participation and inspiration), and absorption (deep focus and immersion) [9].

Motivation is another essential factor, serving as an internal force that drives effort and sustains goal-directed behavior. Mariappanadar [6] defines motivation as the process explaining the intensity, direction, and persistence of an individual’s actions, while Pham *et al.* [10] describe it as a mental state that pushes individuals to achieve peak performance. The NTSC, a non-structural institution responsible for investigating transportation accidents to enhance safety, publishes investigation reports online, with output steadily increasing from 2018 to 2022.

Previous studies on employee performance have shown mixed findings. Research by Audenaert *et al.* [11] indicates that transformational leadership positively affects employee performance, whereas Deole *et al.* [12] found no significant effect. Studies by Khan *et al.* [13] and Shao & Bernstein [14] demonstrate that work engagement positively and significantly impacts performance, while research by Ahmed & Faheem [15] confirms a positive influence of work motivation, but Dan *et al.* [16] observed a positive yet non-significant effect. Additionally, Schwatka *et al.* [17] found that work engagement mediates the relationship between transformational leadership and performance, and Morf & Bakker [18] reported a similar mediating effect for motivation.

However, research specifically addressing the NTSC context remains limited. The rise in transportation incidents under the NTSC’s oversight raises questions about how transformational leadership, engagement, and motivation influence employee performance and, by extension, transportation safety outcomes. Conflicting findings from prior studies further emphasize the need for context-specific investigation.

This study addresses the following research questions:

RQ1: How does transformational leadership influence the work engagement of NTSC employees?

RQ2: How does transformational leadership influence the work motivation of NTSC employees?

RQ3: How does transformational leadership influence the performance of NTSC employees?

RQ4: How does work engagement influence the performance of NTSC employees?

RQ5: How does work motivation influence the performance of NTSC employees?

RQ6: How does transformational leadership indirectly influence employee performance through work engagement and work motivation at the NTSC?

These research questions are designed to examine the complex interactions between leadership style, employee engagement, motivation, and performance within the NTSC. The study focuses on understanding these relationships in the NTSC’s operational context, which has recently experienced a notable increase in transportation-related incidents. By addressing these questions, the research aims to clarify how transformational leadership shapes employees’ motivation and engagement, and in turn, how these factors influence their overall performance. This inquiry is especially important given mixed evidence in previous studies—for example, Audenaert *et al.* [11] found transformational leadership to positively affect performance, whereas Deole *et al.* [12] reported no significant effect. Similarly, while Ahmed and Faheem [15] reported a positive impact of motivation on performance, Dan *et al.* [16] observed only a weak, non-significant effect. Additionally, this study investigates whether work engagement and motivation act as mediators between transformational leadership and performance, a relationship supported in other contexts by Schwatka *et al.* [17] and Morf and Bakker [18] but not yet explored in the NTSC setting. By addressing these gaps, the research intends to provide empirical evidence relevant to organizational behavior in safety oversight institutions and offer actionable guidance to improve NTSC employee performance, ultimately contributing to safer transportation in Indonesia.

The paper has been structured to provide a logical flow from theory to application. The Introduction establishes the research problem and rationale. The Literature Review examines prior studies and theoretical foundations, including transformational leadership, work engagement, motivation, and employee performance. The Methods section outlines the research design, participant selection, data collection, and analytical approach to ensure transparency and reproducibility. Results presents the empirical findings in line with the research questions and hypotheses. Discussion interprets these results, situating them within existing literature and highlighting implications for the NTSC. The Conclusions section summarizes the study’s contributions to understanding how transformational leadership influences employee outcomes. Limitations and Future Research addresses the study’s constraints and proposes directions for further investigation. Finally, Managerial Implications translates the findings into practical recommendations for NTSC leadership, offering strategies to enhance organizational performance. This structured approach ensures a comprehensive understanding that integrates theoretical insights with practical relevance.

Literature Review

Social Exchange Theory (SET) and Self-Determination Theory (SDT)

Social Exchange Theory (SET), introduced by Blau [19], suggests that social interactions are driven by reciprocal exchanges aimed at maximizing benefits while minimizing costs. Within organizations, SET helps explain how employee-employer relationships develop, emphasizing reciprocity in workplace interactions [20-22]. Positive actions by employers—such as support, recognition, and fairness—tend to elicit positive responses from employees, including loyalty, commitment, and engagement [23-25]. Ekowati *et al.* [26] further note that the balance of power and mutual dependence in these exchanges is critical to sustaining employee satisfaction and engagement.

Self-Determination Theory (SDT), formulated by Ryan and Deci [27], asserts that people have universal psychological needs for autonomy, competence, and relatedness. Fulfillment of these needs fosters intrinsic motivation, leading to greater engagement, performance, and well-being [28, 29]. Within organizations, meeting these needs can enhance employees' work commitment and overall productivity.

Combining SET and SDT provides a richer understanding of workplace dynamics. SET explains how positive leadership actions, such as transformational leadership, create reciprocal exchanges that boost engagement and motivation [20-23]. Meanwhile, SDT highlights how these interactions satisfy employees' psychological needs, strengthening intrinsic motivation and driving performance [27, 30]. Together, these theories offer a comprehensive lens to explore how leadership and organizational practices influence employee outcomes.

Transformational leadership

Transformational leadership represents a leadership approach that goes beyond conventional performance expectations, encouraging employees to engage in their work at a level that exceeds standard requirements. This leadership style synthesizes elements from trait-based, behavioral, and situational approaches, emphasizing the cultivation of trust, team cohesion, collective efficacy, and a learning-oriented organizational culture. Singh *et al.* [31] describe transformational leadership as a style that extends beyond simple transactional exchanges, such as reward-for-performance schemes, emphasizing trust, commitment, and mutual respect. Similarly, Mulla and Krishnan [32] suggest that transformational leaders inspire followers to prioritize organizational objectives over personal agendas, significantly shaping their attitudes and behaviors.

From the perspective of Social Exchange Theory (SET), transformational leadership functions as a sophisticated relational system. It extends beyond material or transactional rewards to include socio-emotional benefits, such as respect, loyalty, and reciprocal commitment. Leaders who adopt this approach create a work environment where interpersonal exchanges are enriched by emotional and psychological bonds, resulting in a workplace that is both productive and intrinsically rewarding [19].

SET posits that when leaders engage in transformational behaviors—such as articulating a compelling vision, offering intellectual stimulation, and providing individualized attention—they foster high-quality, trust-based relationships with followers [33]. These relationships encourage employees to reciprocate through heightened engagement, voluntary efforts, and behaviors that exceed formal job requirements [34-36]. In this sense, transformational leadership accrues “social credit” with employees, motivating them to contribute beyond contractual obligations and cultivating a culture of interdependence and mutual accountability.

Self-Determination Theory (SDT) provides a complementary perspective, focusing on intrinsic motivation [27]. According to SDT, humans have fundamental psychological needs for autonomy, competence, and relatedness. Transformational leaders address these needs by empowering employees, fostering belonging, and presenting challenging, meaningful tasks [7]. When employees perceive that their roles allow autonomy, offer opportunities to develop competence, and promote connectedness, intrinsic motivation is enhanced—a more sustainable driver of high performance than extrinsic rewards alone [28]. By supporting these psychological needs, transformational leaders facilitate internalization of organizational values and alignment of individual goals with organizational objectives [37].

Viewed through the dual lenses of SET and SDT, transformational leadership can be understood as a powerful strategy that promotes both positive social exchanges and fulfillment of intrinsic psychological needs, resulting in a more engaged, motivated, and high-performing workforce. Based on this discussion, the following hypotheses are proposed:

H1: Transformational leadership influences the work engagement of NTSC employees.

H2: Transformational leadership influences the work motivation of NTSC employees.

H3: Transformational leadership influences the performance of NTSC employees.

Work engagement

Work engagement is conceptualized as a positive, fulfilling, work-related state characterized by energy, dedication, and absorption [38, 39]. Dwivedi *et al.* [38] define engagement as a proactive mindset in which employees approach their responsibilities with vigor (demonstrating energy and persistence), commitment (actively embracing challenges), and immersion (deep focus and enjoyment in their tasks). Ginting *et al.* [40] further emphasize that engagement encompasses physical, mental, and emotional investment in work. Cognitively, it reflects employees' perceptions and beliefs about their

organization and leadership; emotionally, it involves feelings toward the organization; and physically, it pertains to the energy expended in completing tasks.

Work engagement can also be understood as a reciprocal response to positive organizational environments, aligning with SET principles [19, 26]. When organizations provide supportive leadership, fair rewards, and recognition, employees tend to respond with greater vigor, dedication, and absorption [41]. These positive exchanges reinforce engagement, creating a mutually beneficial cycle.

From the SDT perspective, work environments that satisfy psychological needs for autonomy, competence, and relatedness foster intrinsic motivation, which is essential for sustaining engagement [42]. The cognitive, emotional, and physical dimensions of engagement align closely with SDT: positive cognitive appraisals enhance competence, favorable emotional experiences promote relatedness, and energetic investment indicates autonomy and capability. When these conditions are met, engagement is strengthened, producing benefits for both employees and the organization.

Integrating SET and SDT provides a comprehensive framework for understanding work engagement. SET emphasizes the importance of positive social exchanges between employees and organizations, while SDT highlights the satisfaction of intrinsic psychological needs. Both frameworks suggest that fulfilling these conditions results in heightened engagement and improved performance.

H4: Work engagement influences the performance of NTSC employees.

Work motivation

Work motivation can be conceptualized as the internal drive that energizes and directs an individual toward achieving work-related goals [43]. Kelly *et al.* [44] describe it as a psychological force that propels individuals to pursue their objectives, arising from either internal dispositions or external stimuli. Similarly, Yu *et al.* [45] define motivation as an impulse that initiates, channels, and sustains behavior, while DeGeest *et al.* [46] highlight three key dimensions: the direction of effort, the intensity of exertion, and the persistence of effort over time. The direction dimension reflects the choices employees make regarding task engagement and adherence to organizational rules; intensity pertains to the energy invested in completing tasks; and persistence refers to the capacity to maintain effort despite challenges.

From a Social Exchange Theory (SET) perspective, work motivation emerges from the quality of interactions between employees and their organization [19]. When employees perceive fairness, support from management, and appropriate recognition for their contributions, they are likely to feel obligated to reciprocate through heightened commitment, effort, and loyalty [47, 48]. Likewise, Self-Determination Theory (SDT) suggests that motivation is strengthened when organizations satisfy employees' psychological needs for autonomy, competence, and relatedness [27]. By combining SET and SDT perspectives, it can be inferred that highly motivated NTSC employees are those who experience supportive exchanges and feel their intrinsic needs are met, leading them to persist, invest effort, and align their behaviors with organizational goals.

H5: Work motivation influences the performance of NTSC employees.

Employee performance

Employee performance refers to the measurable outcomes of an individual's work, encompassing both quality and quantity in relation to assigned responsibilities [49, 50]. Spencer *et al.* [51] further frame performance as the sum of actions taken—or neglected—by employees within the organizational context. Through the lens of SET, performance is shaped by perceived fairness and reciprocity in the workplace: when employees sense that their contributions are acknowledged and rewarded appropriately, they are motivated to sustain or enhance their performance levels [20-22].

Integrating SET and SDT, transformational leadership is posited to cultivate a supportive environment that satisfies employees' psychological needs while facilitating positive social exchanges. Such an environment not only enhances intrinsic motivation (SDT) but also encourages reciprocation through behaviors like increased engagement and effort (SET), culminating in improved performance outcomes.

H6: Transformational leadership indirectly influences employee performance at the NTSC through both work engagement and work motivation.

Research conceptual framework

To construct the proposed structural model, the literature on transformational leadership, work engagement, work motivation, and employee performance was reviewed comprehensively. This review provided the theoretical and empirical foundation for hypothesizing the relationships among these constructs.

Figure 1 presents the conceptual framework of the study, illustrating the hypothesized direct and indirect pathways linking transformational leadership with employee performance at the NTSC, mediated by work engagement and work motivation.

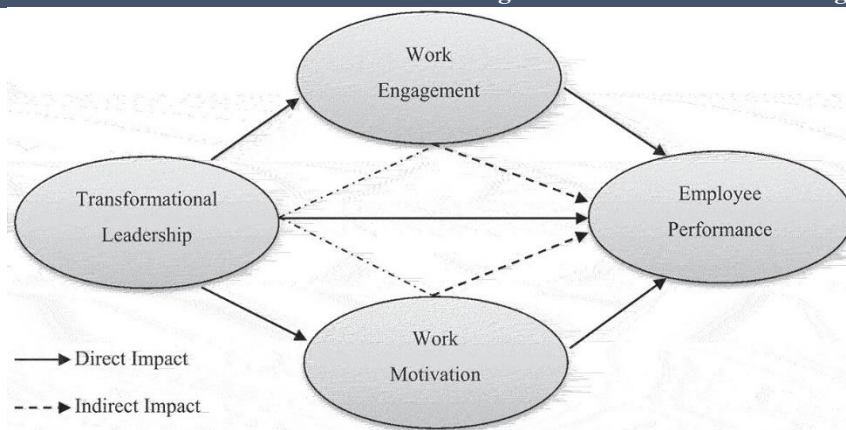


Figure 1. Research conceptual framework.

Methods

This section outlines the general methodology of the study, covering details on the population and sample, data collection procedures, and the analytical techniques employed.

Population and sample

The study population comprises all employees of the NTSC, totaling 107 individuals. Because the population size is relatively small, the study employed a census sampling method, including every member of the population in the research [52-54]. Census sampling is particularly suitable in situations where the population is manageable in size, allowing each individual's response to contribute to the analysis. This approach ensures that the results reflect the characteristics of the entire population directly, eliminating the need for generalization from a subset [55]. Given the study's focus on NTSC employees, capturing responses from all personnel enhances the comprehensiveness and accuracy of the findings.

Demographic characteristics of the sample are presented in **Table 1**, including gender, educational background, and years of service. Frequency counts and percentages are provided to offer a detailed overview of the sample composition. The gender distribution shows that males constitute the majority (73%) of the workforce, which may be relevant when considering gender-related organizational dynamics. Educational attainment varies, with the largest proportion holding a Magister degree (36%), followed by Graduate School qualifications (28%), indicating a highly educated employee base. Years of service are categorized into three groups, with the 1–5-year category representing half of the workforce (50%), suggesting a substantial proportion of relatively new employees. This distribution may influence organizational factors such as loyalty, familiarity with NTSC protocols, and adaptation to workplace culture, which are relevant considerations when interpreting the study's outcomes.

Table 1. Sample demographic data

Variables	Values	Frequency	Percentage
Gender	Male	78	73%
	Female	29	27%
Education	High School	11	10%
	Three-year college	24	22%
	Graduate School	30	28%
	Magister	39	36%
	Doctorate	3	3%
Years of service	1–5 Years	53	50%
	5–10 Years	14	13%
	>10 Years	40	37%

The detailed description of the population and sample provides essential context for the study, clarifying the boundaries and relevance of the research findings. Since the study encompasses the entire NTSC workforce, the results are highly representative of this organization. However, caution should be exercised when applying these findings to other organizations that may differ in size, structure, or employee characteristics.

Instruments

This study focuses on four primary constructs: transformational leadership, work engagement, work motivation, and employee performance. The measurement tools were initially developed in Bahasa Indonesia, with all questionnaire items summarized in Table 2. Prior to administering the survey to the full sample, a preliminary wording test was conducted with 10 individuals

to ensure clarity and comprehension. This pilot check was intended to minimize the risk of misunderstandings and ensure that respondents could accurately interpret the questions during the main data collection phase.

Table 2. Variable Operationalization

Variable	Dimension	Indicators
Transformational Leadership [56, 57]	Idealized Influence	a. Earns respect from employees b. Builds trust c. Serves as a role model
	Inspirational Motivation	a. Acts as a motivator b. Sets clear goals
	Intellectual Stimulation	a. Encourages innovative thinking b. Effective in problem-solving
	Individual Consideration	a. Supports career growth b. Promotes a positive work environment c. Maintains strong relationships with subordinates
Work Engagement [41]	Vigor	a. Demonstrates high energy b. Shows willingness to take on challenges c. Persists despite difficulties
	Dedication	a. Finds work meaningful b. Shows enthusiasm and pride in work c. Feels inspired by tasks
	Absorption	a. Maintains deep focus b. Fully immerses in work activities
Motivation [58]	Need for Achievement	a. Strives for creativity and innovation b. Pursues high-performance goals
	Need for Affiliation	a. Seeks acceptance within work and social environment b. Desires progress and avoids failure c. Wants to feel involved and part of the team
	Need for Power	a. Aspires to attain influential positions b. Seeks opportunities to exert authority effectively
Employee Performance [59]	Quality	a. Ensures accuracy b. Achieves successful outcomes
	Quantity	a. Produces sufficient output b. Completes tasks efficiently
	Reliability	a. Follows instructions diligently b. Shows initiative c. Performs tasks carefully
	Attitude	a. Maintains a positive attitude toward the organization b. Exhibits professionalism in work c. Cooperates effectively with others

Transformational leadership was assessed using Yukl's [57] four-dimensional framework, comprising 10 items: three items for idealized influence, two for inspirational motivation, two for intellectual stimulation, and three for individual consideration. This instrument was developed through extensive literature review and empirical validation based on prior studies on transformational leadership [56]. Work engagement was measured using Bakker's [41] three-dimensional model, with three items assessing vigor, three items for dedication, and two items for absorption. Work motivation was evaluated through Robbins and Judge's [58] three-factor model: achievement needs (two items), affiliation needs (three items), and power needs (two items). Employee performance was measured according to Dessler's [59] four dimensions: quality (two items), quantity (two items), reliability (three items), and attitude (three items).

The questionnaire was translated into Bahasa Indonesia to ensure clarity and relevance for NTSC employees. Certain adjustments were made to align the wording with the organizational context, such as incorporating terminology familiar to employees and tailoring scales to reflect NTSC performance metrics. This adaptation ensures that the measured constructs accurately reflect the NTSC work environment. Respondents provided their answers using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), enabling a nuanced assessment of their perceptions and attitudes.

Data analysis techniques

The study utilized Partial Least Squares (PLS) analysis via SmartPLS version 3.0. PLS was selected due to its ability to handle complex models with multiple constructs and indicators [60]. Its variance-based, prediction-oriented approach allows for a detailed examination of relationships among transformational leadership, work engagement, work motivation, and employee performance, while accommodating non-normal data distributions commonly encountered in real-world research [61]. PLS also permits simultaneous assessment of the measurement model and structural model, ensuring evaluation of both the constructs' validity and reliability, as well as the hypothesized relationships among them [62].

Results

Measurement model

The measurement model in this study employed reflective indicators, examining how well each item corresponds to its underlying latent variable through PLS. Convergent validity was assessed by ensuring indicator loadings exceeded 0.70, while discriminant validity was tested using the Fornell-Larcker criterion, requiring the square root of the Average Variance Extracted (AVE) for each construct to be greater than its correlations with other constructs [61]. Internal consistency reliability was evaluated using composite reliability, with values above 0.70 considered acceptable for exploratory research [62].

Ringle *et al.* [60] recommend retaining indicators with loadings above 0.7, while items with loadings below 0.4 are typically discarded. Items with loadings between 0.4 and 0.7 may be retained or removed depending on their relative strength. In this study, a cutoff of 0.6 was applied. AVE values were also required to exceed 0.5 to ensure that the constructs explained the majority of variance in their indicators, which is a key requirement for reflective measurement models.

Descriptive analysis and item consistency results are presented in Table 3. Certain items—TL1, WE4, WM4, WM5, WM6, and JP1—demonstrated outer loadings below 0.60. These items were removed to improve the overall validity and reliability of the constructs. Eliminating low-loading items ensures that the remaining indicators more accurately reflect their respective constructs, strengthening internal consistency and enhancing the measurement model's capacity for reliable hypothesis testing and predictive analysis.

Table 3. Descriptive analysis and item internal consistency estimates

Construct	Dimensions	M	Item	OL	AVE	CR
Transformational Leadership	Idealized Influence	4.37	TL1	0.591	0.501	0.741
			TL2	0.626		
			TL3	0.802		
	Inspirational Motivation	4.19	TL4	0.806		
			TL5	0.720		
	Intellectual Simulation	4.19	TL6	0.618		
			TL7	0.743		
	Individual Consideration	4.38	TL8	0.703		
			TL9	0.719		
			TL10	0.705		
Work Engagement	Vigor	4.25	WE1	0.745	0.543	0.822
			WE2	0.663		
			WE3	0.758		
	Dedication	4.36	WE4	0.570		
			WE5	0.735		
			WE6	0.776		
	Absorption	4.14	WE7	0.836		
			WE8	0.778		
Job Motivation	Needs of achievement	4.39	WM1	0.774	0.536	0.712
			WM2	0.811		
	Needs of Affiliation	3.82	WM3	0.859		
			WM4	0.407		
			WM5	0.525		
	Needs of Power	3.96	WM6	0.473		
			WM7	0.626		
Employee Performance	Quality	4.05	EP1	0.295	0.560	0.754
			EP 2	0.841		
	Quantity	4.56	EP 3	0.812		
			EP 4	0.795		
			EP 5	0.724		
	Reliability	4.31	EP 6	0.810		
			EP 7	0.848		
			EP 8	0.782		
	Attitude	4.21	EP 9	0.785		
			EP 10	0.623		

Note: M=Mean; OL= Outer Loading; AVE= Average Variance Extracted; CR=Composite Reliability; $n = 107$

The Fornell-Larcker criterion requires that the square root of a construct's AVE exceed its correlations with all other reflective constructs, as illustrated in **Table 4**.

Table 4. Fornell Larcker Criterion

	Transformational Leadership	Work Engagement	Work Motivation	Employee Performance
Transformational Leadership	0.768			
Work Engagement	0.702	0.769		
Work Motivation	0.744	0.693	0.880	
Employee Performance	0.755	0.753	0.781	0.784

In Table 4, the diagonal values, representing the square roots of each construct's AVE, are greater than the correlations with other constructs (off-diagonal values), indicating that each construct is distinct and explains more variance in its own indicators than in other constructs. This satisfies a crucial criterion for establishing discriminant validity. The values shown are illustrative; in practice, they would be replaced with the actual results from the study. **Figure 2** presents the modified model, showing that all item loadings exceed the 0.6 threshold.

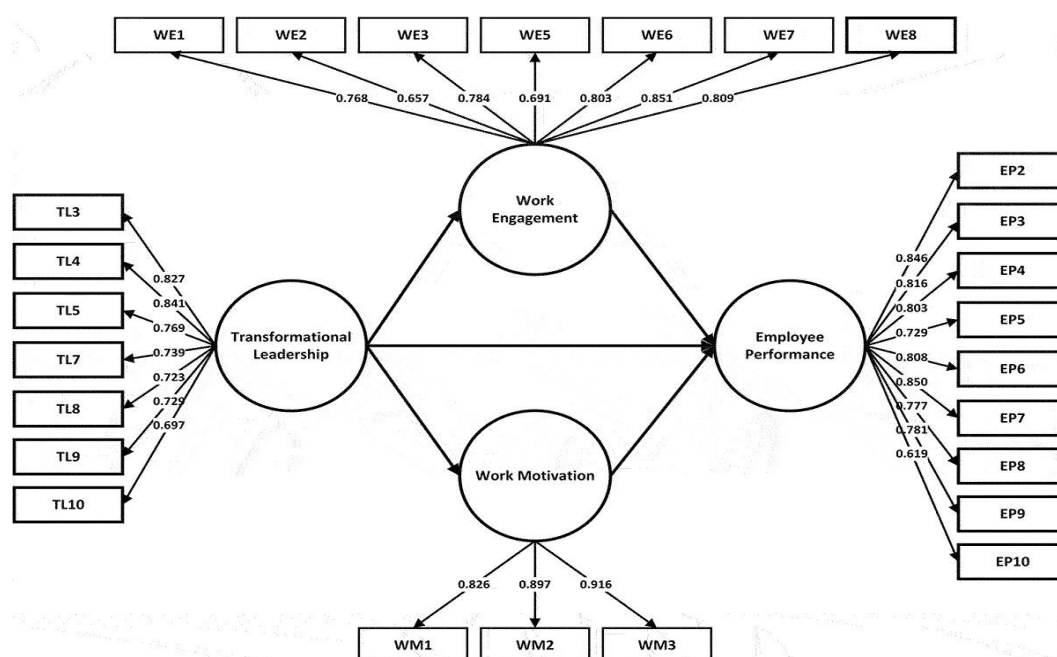


Figure 2. Loading factor testing modified

Predictive relevance (Q^2)

Predictive relevance (Q^2) is a metric in Partial Least Squares Structural Equation Modeling (PLS-SEM) used to evaluate how well the model predicts the data for a given endogenous construct. Unlike covariance-based SEM, PLS-SEM emphasizes prediction, making Q^2 a critical indicator. The Q^2 value is calculated using the formula:

$$Q^2 = 1 - (1 - R1^2) (1 - R2^2) (1 - R3^2)$$

$$Q^2 = 1 - (1 - 0.451) (1 - 0.500) (1 - 0.716)$$

$$Q^2 = 1 - (0.549) (0.500) (0.284)$$

$$Q^2 = 1 - (0.077)$$

$$Q^2 = 0.923$$

A Q^2 value of 0.923 indicates substantial predictive relevance, as values greater than 0 confirm that the model effectively predicts the endogenous constructs. This high value implies that the independent variables provide significant information about the dependent variables, demonstrating that the model can reliably forecast outcomes and identify influential predictors within the dataset.

Path analysis

To test the research hypotheses, bootstrapping was applied to evaluate the significance of path coefficients and their corresponding T-statistics, which is essential for hypothesis testing in the structural model. Following Hair *et al.* [63], a 95% bias-corrected and accelerated (BCa) bootstrap confidence interval was used to account for potential bias and skewness in the bootstrap distributions, ensuring more accurate inference. In addition, p-values were examined, with a threshold of <0.05 indicating statistical significance [52]. The outcomes of the hypothesis testing, including path coefficients, T-statistics, p-

values, and the acceptance or rejection of hypotheses, are summarized in **Table 5**. This approach provides a rigorous assessment of the structural relationships, reinforcing the validity and reliability of the study's findings.

Table 5. Hypothesis testing

Path	Original Sample (O)	T Statistics (O/STDEV)	P Values	Decision
Direct Effect				
Transformational leadership → Work engagement	0.672	10.754	0.000	Accepted
Transformational leadership → Work Motivation	0.707	15.306	0.000	Accepted
Transformational leadership → Employee performance	0.208	2.220	0.027	Accepted
Work engagement → Employee performance	0.342	3.678	0.000	Accepted
Work Motivation → Employee performance	0.392	4.495	0.000	Accepted
Indirect Effect				
Transformational leadership → Work engagement → Employee performance	0.222	3.528	0.000	Accepted
Transformational leadership → Work Motivation → Employee performance	0.282	3.961	0.000	Accepted

Table 5 displays the results of hypothesis testing, examining how transformational leadership affects NTSC employees' work engagement, motivation, and overall performance.

The results indicate that transformational leadership strongly boosts work engagement, with a path coefficient of 0.672, a T-statistic of 10.754, and a p-value of 0.000, confirming the hypothesis. Its effect on work motivation is even more pronounced, with a path coefficient of 0.707, a T-statistic of 15.306, and a p-value of 0.000, showing that leaders play a major role in enhancing employee motivation and engagement. The direct influence of transformational leadership on employee performance is positive but relatively weaker, with a path coefficient of 0.208, a T-statistic of 2.220, and a p-value of 0.027. Employee performance is positively impacted by work engagement (path coefficient 0.342, T-statistic 3.678, p-value 0.000) and work motivation (path coefficient 0.392, T-statistic 4.495, p-value 0.000), indicating that highly engaged and motivated employees perform better.

The analysis of indirect effects shows that transformational leadership enhances performance through the mediating roles of engagement and motivation. The indirect effect via engagement has a path coefficient of 0.222 (T-statistic 3.528, p-value 0.000), while via motivation it is 0.282 (T-statistic 3.961, p-value 0.000). These findings suggest that the leadership style improves performance both directly and indirectly by elevating employees' engagement and motivation.

Overall, these results emphasize that transformational leadership at NTSC not only influences employee outcomes directly but also fosters a workplace environment that encourages high levels of engagement, motivation, and performance.

Discussion

This study explored how transformational leadership shapes employee performance at NTSC, particularly through engagement and motivation. The findings show that leaders exhibiting characteristics such as idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration significantly enhance employees' engagement. Strategies like knowledge sharing and training further strengthen engagement.

The results are consistent with previous studies [64, 65] that highlight the positive link between transformational leadership and employee engagement. At NTSC, transformational leadership also builds employees' confidence, indirectly supporting performance outcomes [66].

Work engagement and motivation were found to partially mediate the relationship between leadership and performance, meaning that while they explain part of the effect, transformational leadership also directly boosts performance. Employees who are engaged and motivated are more committed, persistent, and confident in fulfilling their tasks, aligning with the findings of Mousa and Othman [67], Deole *et al.* [12], and Khtatbeh *et al.* [68]. Motivated employees exhibit greater focus and determination, corroborating the work of Mgamal and Al-Matari [69] and Kim and Lee [70].

In summary, transformational leadership serves as a cornerstone for cultivating an engaged, motivated, and high-performing workforce at NTSC. Management should prioritize nurturing such leadership behaviors, as they significantly influence both employee well-being and organizational performance. These findings are reinforced by prior research on mediating effects of engagement and motivation [71-74].

Furthermore, the study aligns with Social Exchange Theory (SET) and Self-Determination Theory (SDT), which suggest that reciprocal relationships and fulfillment of intrinsic psychological needs are key mechanisms through which leadership drives performance. NTSC's emphasis on transformational leadership fosters a supportive climate that promotes long-term employee effectiveness and organizational success.

Conclusions

This study within the NTSC context demonstrates that transformational leadership significantly drives employee engagement, motivation, and overall performance. Leaders who exhibit transformational behaviors—such as articulating a compelling vision, inspiring employees, promoting creative thinking, and attending to individual needs—positively influence their teams. Beyond directly affecting performance, this leadership style cultivates a workplace where employees feel more connected to their roles and are motivated to exceed expectations. The findings emphasize that transformational leadership enhances work engagement and motivation, which subsequently elevates performance. By investing in the development of transformational leaders, NTSC can foster a workforce that is more dynamic, committed, and productive. Training programs aimed at strengthening these leadership capabilities offer an effective pathway for improving organizational efficiency and achieving critical performance and safety goals. Ultimately, transformational leadership not only uplifts individual employees but also drives collective organizational advancement, aligning leadership development with the NTSC's strategic objectives and promising significant returns in performance and effectiveness.

Limitations and future research directions

Several limitations should be acknowledged. The study's focus on NTSC employees may limit the generalizability of findings to other organizations or cultural contexts. Future research could expand the sample to include diverse organizational settings to enhance external validity. Moreover, the current model examines only a limited set of variables. Incorporating additional constructs—such as organizational culture, HR practices, job satisfaction, and organizational citizenship behavior—could offer a more holistic understanding of the determinants of employee performance. Complementing quantitative approaches with qualitative methods, such as interviews or observational studies, may provide richer insights into workplace dynamics and the subtleties of employee behaviors, thereby capturing a more nuanced picture of organizational functioning.

Managerial implications

This study highlights practical insights for NTSC management to enhance leadership effectiveness and employee outcomes. Leaders should actively communicate the organization's vision and mission with transparency, ensuring employees understand strategic goals. By modeling behaviors aligned with organizational objectives, leaders can serve as examples, reinforcing policies and practices that support the NTSC's mission. Operational improvements that reflect the organization's vision can further clarify performance expectations and create tangible value for employees.

Recognizing and valuing employees' time and contributions is critical. Providing flexible work arrangements and clear explanations of organizational goals helps employees align their personal objectives with the company's vision, increasing engagement and enthusiasm. Leaders should motivate employees by setting clear, achievable goals and providing opportunities for autonomy in reaching them, which enhances commitment and urgency. Clear performance targets, combined with ongoing support, enable employees to focus their efforts and contribute meaningfully to organizational progress. By fostering an environment that inspires growth, provides direction, and rewards effort, NTSC management can cultivate a motivated, engaged, and high-performing workforce.

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