

The Role of Transformational Leadership in Fostering Innovative Work Behavior Through Employee Engagement: Empirical Evidence from Indonesia's Electricity Sector Toward a Green Industrial Transition

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ABSTRACT

This study aims to analyze and examine the effect of Transformational Leadership on Innovative Work Behavior with Employee Engagement as a mediating variable in the electrical industry in Indonesia. This study uses a quantitative approach with an explanatory design. Data were collected from 275 employees at four transformer manufacturing companies located in Bekasi, Bogor, Tangerang, and Surabaya. Data analysis was performed using Structural Equation Modeling (SEM) with the help of AMOS 23 software. The results indicate that Transformational Leadership has a positive and significant effect on both Innovative Work Behavior ($\beta = 0.357$) and Employee Engagement ($\beta = 0.468$). Moreover, Employee Engagement positively influences Innovative Work Behavior ($\beta = 0.374$). The study also reveals a significant indirect effect of Transformational Leadership on Innovative Work Behavior through Employee Engagement ($\beta = 0.175$), confirming the mediating role of engagement in the proposed model. Transformational Leadership has been shown to play a pivotal role in enhancing employee engagement and fostering innovative behavior within the electricity sector. These findings offer strategic insights for organizational leaders to strengthen human resource capabilities and drive the transition toward a green industry, aligned with sustainability goals and energy efficiency initiatives. This study offers an original contribution by providing empirical evidence from Indonesia's electricity sector a strategic industry in the national energy transition that has been rarely explored from the perspectives of innovative behavior and transformational leadership. It integrates the concepts of leadership, employee engagement, and innovation into a comprehensive framework that can serve as a valuable reference for future research and human resource management practices in the era of green industry transformation. Theoretically, this study expands the understanding of the mediating role of Employee Engagement in the relationship between Transformational Leadership and Innovative Work Behavior, particularly in the context of a sustainability-oriented electricity industry. Practically, this research provides insights for organizations to design leadership policies that can foster a culture of innovation and increase employee engagement to support the achievement of the 2060 Net Zero Emissions target.

Keywords: Transformational Leadership, Employee Engagement, Innovative Work Behavior, Electricity Industry

INTRODUCTION

Industrial transformation toward sustainability requires organizations particularly those in the electricity sector to strengthen their innovation capacity in response to global challenges such as decarbonization, digitalization, and the transition to clean energy. In this context, innovative work behavior (IWB) plays a crucial role in enabling organizations to adapt and remain competitive amid rapid changes toward an environmentally friendly industry (Mehmood et al., 2020; Despinur Dara, 2021). One factor that has consistently been shown to promote the emergence of IWB is transformational leadership a leadership style that emphasizes an inspirational vision, trust, and motivation to transcend personal interests for the sake of collective goals (Bass & Avolio, 1994; Vu et al., 2025). Numerous studies have confirmed that transformational leadership enhances intrinsic motivation, affective commitment, and job satisfaction, which ultimately foster innovative behavior (Jun & Lee, 2023; Bahagia et al., 2024; Ishaq & Haleema, 2024).

Employee engagement serves as a key mechanism mediating the relationship between transformational leadership and innovative work behavior (Helmy et al., 2023; Vu et al., 2025). Highly engaged employees exhibit energy, dedication, and concentration at work, which make them more motivated to generate new ideas and solutions that support sustainability (Karimi et al., 2023; Singh et al., 2023). Transformational leaders can foster positive psychological conditions such as work meaning, self-efficacy, and intrinsic motivation that enhance engagement and ultimately drive innovation (Vu et al., 2025). In the context of Indonesia's electricity industry, the push for innovation has become increasingly urgent in line with the national commitment to achieving Net Zero Emissions by 2060. Companies such as PLN and its industry partners are facing growing demands to integrate green technologies, digital systems, and renewable energy sources. However, data indicate that employee engagement levels remain below target (<80%), while turnover rates exceed the ideal standard (<1% per year), underscoring the need for more effective leadership strategies to strengthen engagement and cultivate a culture of innovation in the workplace. In the context of Indonesia's electricity industry, the push for innovation has become increasingly urgent in line with the national commitment to achieving Net Zero Emissions by 2060. Companies such as PLN and its industry partners face growing demands to integrate green technologies, digital systems, and renewable energy sources. However, data indicate that employee engagement levels remain below the target (<80%), while turnover rates exceed the ideal standard (<1% per year), underscoring the need for more effective leadership strategies to strengthen engagement and foster a culture of innovation in the workplace.

Based on this context, this study is entitled "The Role of Transformational Leadership in Encouraging Innovative Work Behavior through Employee Engagement: Empirical Evidence from the Electricity Sector in Indonesia Toward an Environmentally Friendly Industrial Transition." The study aims to examine how transformational leadership fosters employee engagement and promotes innovative work behavior, which serve as crucial foundations for accelerating the transition of Indonesia's electricity industry toward sustainability. It is expected that the findings will contribute to the literature on leadership and innovation, while offering practical recommendations for adaptive, innovative, and green-oriented human resource management strategies.

Underpinning Theory

This study is grounded in Organizational Behavior as a grand theory, which examines interactions among individuals and groups and the influence of organizational structure and culture on effectiveness (Dougherty & Pfaltzgraff, 1990; Robbins & Judge, 2023; Luthans, 2021). At the middle theory level, the study draws on Colquitt, LePine, and Wesson's (2025) organizational behavior model, which demonstrates that leadership style affects motivation and employee engagement, which in turn fosters innovative behavior, with individual psychological mechanisms acting as mediators (Saks, 2021; Gupta et al., 2023; Li & Zhang, 2022; Antonakis & House, 2014). At the applied theory level, transformational leadership and employee engagement are considered critical for promoting innovative behavior, as studies indicate that transformational leadership enhances employee engagement and encourages innovative work behavior (Bass & Avolio, 1994; Northouse, 2023; Vu et al., 2025; Breevaart et al., 2014).

Innovative Work Behavior (IWB) refers to employees' deliberate actions in generating, promoting, and implementing new ideas that benefit both individuals and organizations (West & Farr, 1990; Janssen, 2000). Unlike creativity, which focuses primarily on idea generation (Amabile, 1988), IWB also emphasizes the practical application of ideas in work processes (West, 2002). Scott and Bruce (1994) describe IWB as comprising three main stages: idea generation, idea promotion, and idea realization, while De Jong and Den Hartog (2010) highlight additional aspects, including seeking creative solutions, encouraging team members' ideas, and risk-taking. Indicators of IWB include proactive, collaborative, and solution-oriented behavior, as well as the ability to identify problems and motivate colleagues to innovate (Janssen, 2000; De Jong, 2008). Recent studies indicate that IWB is influenced by inspirational leadership and high work engagement (Carmen & Arguello, 2023; Vu et

al., 2025), with transformational leadership and employee engagement playing a key role in strengthening innovative behavior in the workplace.

Transformational leadership is a leadership style that emphasizes the leader's ability to inspire, motivate, and develop followers' potential to achieve higher goals (Burns, 1978; Bass, 1985). This approach focuses on changing values, aspirations, and behavior through transcendental motivation (Bass, 1985) and mutually beneficial reciprocal relationships (Burns, 1978). Northouse (2021) asserts that transformational leadership fosters positive change through a clear vision and support for personal development, while Avolio and Yammarino (2022) highlight the importance of deep relationships between leaders and followers. Bass (1985) identifies three core components of this leadership—idealized influence, individualized consideration, and intellectual stimulation which Robbins and Judge (2015) later expanded into four key indicators, including inspirational motivation. Rafferty and Griffin, cited in Avolio et al. (Suwatno, 2019), further emphasize vision, supportive leadership, and personal recognition as elements that strengthen interpersonal relationships within organizations. Recent studies indicate that transformational leadership significantly influences motivation, creativity, and innovative behavior (Zhang et al., 2021; Lee & Yu, 2022; Nafukho et al., 2023; Khan & Khan, 2024; Vu et al., 2025), suggesting that this leadership style acts as a catalyst for creating an innovative, collaborative, and sustainable work environment.

Employee engagement is defined as an individual's cognitive, emotional, and physical attachment to their work (Kahn, 1990; Schaufeli & Bakker, 2004). This concept has evolved into a positive psychological state characterized by vigor, dedication, and absorption (Schaufeli, 2023). Highly engaged employees tend to demonstrate optimal performance, strong loyalty, and significant contributions to organizational innovation (Schaufeli & Bakker, 2004). Robinson et al. (2004) describe engagement as a positive attitude toward organizational values, while Wiley (2012) highlights the importance of discretionary or voluntary effort at work. Hughes and Rog (2008) and Macey et al. (2009) add that employee engagement represents emotional and intellectual attachment that encourages maximum contribution to organizational success. Recent studies (Nguyen et al., 2023; Li et al., 2024) indicate that employee engagement serves as a critical mediator in the relationship between transformational leadership and innovative work behavior, as transformational leaders foster work meaning, motivation, and collective spirit that strengthen innovative behavior in dynamic environments.

Thus, the integration of Innovative Work Behavior, Transformational Leadership, and Employee Engagement forms a conceptual framework explaining how transformational leadership promotes innovative work behavior through enhanced employee engagement (Colquitt et al., 2021; Zhang et al., 2023; Malik et al., 2022). This framework is particularly relevant to the Indonesian electricity industry, which is currently undergoing a transformation toward digitalization and environmental sustainability.

Literature Review and Hypotheses

Transformational leadership plays a crucial role in enhancing Innovative Work Behavior (IWB) through organizational learning and performance improvement (Owens & Hekman, 2012). Research by Amy B.C. Tan et al. (2023) demonstrates that lean innovation training combined with transformational leadership increases creativity and innovative behavior. Similarly, Afsar and Umrani (2020) provide evidence of the positive effect of transformational leadership on IWB through learning motivation, with an innovation climate serving as a moderator.

Further studies highlight additional mechanisms: Nordin, Kamil, and Govindaraju (2024) confirm that work autonomy mediates the relationship between transformational leadership and IWB, while Iqbal, Ahmad, and Nazir (2023) show that transformational leadership influences IWB through affective commitment, although servant leadership may be more effective when creative self-efficacy is considered. Moreover, Alshahrani (2024) and Li et al. (2024) indicate that transformational leadership enhances motivation, team innovation, organizational performance, and the development of new green products, reinforcing its role in fostering a sustainable innovative culture.

H₁: The Effect of Transformational Leadership on Innovative Work Behavior.

Employee engagement plays a crucial role in promoting innovative work behavior (IWB). Marampa, Pongtuluran, and Pariyanti (2025) found that kinship-based employee engagement moderates the relationship between psychological empowerment and IWB, whereas Owusu et al. (2025) demonstrated that employee engagement mediates the relationship between job autonomy and IWB. Studies by AlMunthiri et al. (2024) and Elamin et al. (2024) confirm that both employee engagement and work engagement mediate the effects of inclusive leadership and knowledge sharing on IWB. Research by Salem et al. (2022) also indicates that employee engagement links workplace spirituality with IWB. Rahman, Hossain, and Akter (2025) highlight that the dimensions of employee engagement (vigor, dedication, absorption) have a significant impact on IWB, while Zhang and Wang (2021) suggest that organizational identification enhances IWB through work engagement. Additionally, studies by Kundi et al. (2023), AlMunthiri et al. (2024), and Indriani et al. (2024) reinforce the

evidence that employee engagement fosters initiative, collaboration, and a sustainable innovative culture across various organizational contexts.

H₂: The Influence of Employee Engagement on Innovative Work Behavior.

Research by Majid et al. (2023) indicates that transformational leadership has a direct effect on role clarity and employee engagement, with role clarity acting as a partial mediator. Balwant, Mohammed, and Singh (2020) also reported a positive relationship between transformational leadership and work engagement, although structural equation modeling results suggest that supervisor support does not always enhance employee engagement. Furthermore, Islam, Furuoka, and Idris (2022) confirmed that transformational leadership significantly influences championing behavior during organizational change, with work engagement serving as a full mediator. Overall, these studies demonstrate that transformational leadership can foster employee engagement by improving role clarity and supporting organizational change.

H₃: The Effect of Transformational Leadership on Employee Engagement.

Various studies indicate that employee engagement plays a crucial mediating role in the relationship between transformational leadership and innovative work behavior (IWB). Singh, Khan, and Rehman (2023) found that transformational leadership positively affects IWB through employee engagement and psychological capital. Similar findings were reported by Wang, Zhang, and Su (2023), who confirmed that transformational leadership strengthens the relationship between proactive personality and work engagement, which in turn fosters innovative behavior. Research by Khari and Bali (2024) also shows that leader mindfulness enhances IWB through the mediation of work engagement, while Kundi, Aboramadan, and Abualigah (2023) found that work engagement mediates the relationship between paradoxical leadership and innovative performance. Alwali (2024) further suggests that transformational leadership amplifies the effect of psychological capital on IWB via work engagement. Additionally, Hooi and Chan (2023) emphasize that transformational leadership directly influences employee engagement in the context of workplace digitalization. Although Vu, Nguyen, and Le (2025) found that psychological empowerment is a stronger mediator than work engagement, the overall evidence indicates that employee engagement remains the primary pathway linking transformational leadership to innovative work behavior.

H₄: The Effect of Transformational Leadership on Innovative Work Behavior Is Mediated by Employee Engagement.

METHODE

This study employs a quantitative approach with an explanatory (causal) design to examine the effect of transformational leadership on innovative work behavior, with employee engagement as a mediating variable. A cross-sectional survey design was chosen to test the causal relationships between variables empirically and measurably (Cooper & Schindler, 2011; Malhotra, 2007).

The research focuses on the electricity industry in Indonesia, specifically four transformer manufacturing companies located in Bekasi, Bogor, Tangerang, and Surabaya. These companies share the same primary customers state-owned enterprises in the electricity sector and consistently implement ISO 9001, ISO 14001, ISO 45001, and SMK3 standards issued by the Ministry of Manpower of the Republic of Indonesia.

The study was conducted from January to July 2025, with a population of 800 employees and a sample of 275 respondents determined using Taro Yamane's formula (1967) at a 5% error rate. Sampling was conducted proportionally through simple random sampling (Arikunto, 2010).

Data were collected using a five-point Likert scale questionnaire developed based on the constructs of transformational leadership (Bass & Avolio, 1994), employee engagement (Schaufeli et al., 2006), and innovative work behavior (Janssen, 2000). Data analysis was performed using Structural Equation Modeling (SEM) in AMOS version 23 to examine both direct and mediating effects.

DATA ANALYSIS

Data analysis was conducted using Structural Equation Modeling (SEM) in AMOS version 23 to examine the validity, reliability, and causal relationships among the variables in the research model. The analysis procedure included testing the measurement model through Confirmatory Factor Analysis (CFA) and evaluating the structural model to assess both direct and indirect effects among latent variables.

Transformational Leadership Variable

The transformational leadership construct was adapted from Bass and Avolio (1994) and comprises four main indicators: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Each indicator was measured using four items, resulting in a total of 16 items. The CFA results

indicate that the standardized factor loadings exceeded 0.5, the average variance extracted (AVE) exceeded 0.5, and the composite reliability (CR) exceeded 0.7. Additionally, the model fit indices met the recommended criteria (CFI > 0.90; TLI > 0.90; RMSEA < 0.08), indicating that the construct is valid and reliable.

Employee Engagement Variable

The employee engagement construct is based on the model by Schaufeli et al. (2006) and comprises three main indicators: vigor, dedication, and absorption, measured using a total of 12 items. The CFA results indicate that all indicators are valid and reliable, with factor loadings greater than 0.5, AVE greater than 0.5, and CR greater than 0.7. The goodness-of-fit indices also demonstrate a good model fit (CFI and TLI > 0.90; RMSEA < 0.08).

Innovative Work Behavior Variable

The innovative work behavior construct was adapted from Janssen (2000) and includes three main indicators: idea generation, idea promotion, and idea realization, measured using a total of 12 items. The CFA results indicate that all items meet the validity and reliability criteria, with factor loadings greater than 0.5, AVE greater than 0.5, and CR greater than 0.7. The model fit indices also demonstrate a good fit (CFI > 0.90; TLI > 0.90; RMSEA < 0.08).

Structural Model and Control Variable Testing

After confirming the feasibility of the measurement model, structural model testing was conducted to examine the direct effect of transformational leadership on innovative work behavior and the indirect effect through employee engagement as a mediating variable. Several demographic variables, including age, education, position, and length of service, were controlled to minimize potential bias (Ahmed et al., 2024; Truong et al., 2024). This approach provides a comprehensive understanding of the mechanisms through which transformational leadership exerts its influence.

Table 1. Descriptive and Collinearity Statistics.

Construct	N	Mean	Stdev	X1	X2	Z	Y
Transformational Leadership X1	275	4,051	0,736	1			
Employee Engagement Z	275	4,049	0,731	0,468	0,498	1	
Innovative Work Behavior Y	275	4,106	0,720	0,532	0,507	0,541	1

DISCUSSION

Descriptive Statistics

The table shows that transformational leadership (X1), employee engagement (Z), and innovative work behavior (Y) have mean values above 4 on a five-point Likert scale, indicating positive responses from respondents to the measured constructs. The relatively small standard deviations (0.720–0.736) suggest a homogeneous data distribution. The correlations between constructs range from 0.468 to 0.541, reflecting moderate positive relationships and remaining below the threshold for problematic multicollinearity (>0.80). According to Hair et al. (2010), correlations below this value indicate the absence of multicollinearity issues, making the data suitable for further analysis, such as Structural Equation Modeling (SEM).

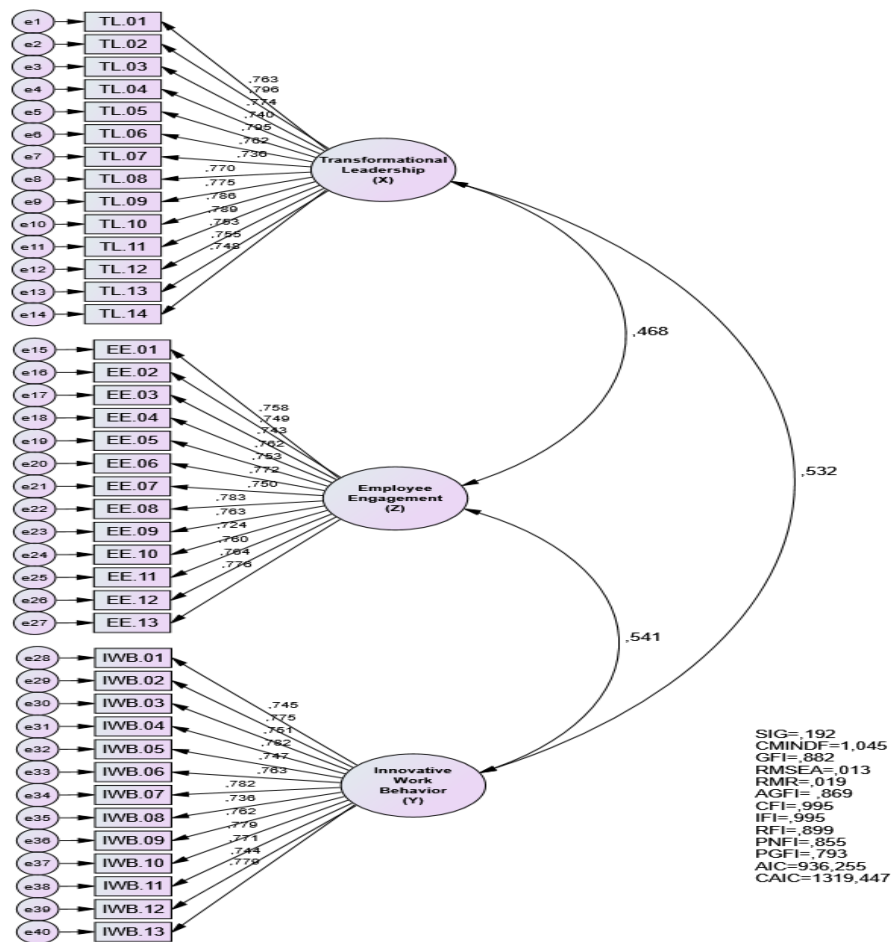


Figure 1. Measurement model.

Confirmatory Factor Analysis (CFA)

The figure above presents the model results. All variables were measured using standardized questionnaires, and confirmatory factor analysis (CFA) was conducted to ensure the validity and reliability of the indicators. The CFA results indicate that all indicators for transformational leadership, employee engagement, and innovative work behavior have factor loadings greater than 0.50 and meet the criteria for AVE (≥ 0.50) and CR (≥ 0.70). Therefore, the instruments are considered valid, reliable, and suitable for subsequent SEM analysis.

Table 2. Respondents’ Demographic Characteristics.

		N	%
Gender	Male	239	86.9
	Female	36	13.1
	Subtotal	275	100.0
Section	Engineer	68	24.7
	Workshop	207	75.3
	Subtotal	275	100.0
Age	20 - 30	82	29.8
	31 - 40	156	56.7
	> 41	37	13.5
	Subtotal	275	100.0
Years od service	2 - 3	26	9.5
	3 - 5	97	35.3
	5 - 10	127	46.2
	>10	25	9.1
	Subtotal	275	100.0
Education	SLTA	62	22.5
	D3	21	7.6

S1	184	66.9
S2	8	2.9
Subtotal	275	100.0

This study involved 275 respondents from the Indonesian electrical industry. Based on demographic characteristics, the majority of respondents were male (86.9%), reflecting the predominance of male workers in technical and production roles in this sector. Most respondents were employed in workshops (75.3%), while the remainder worked in engineering (24.7%), indicating that most participants were directly engaged in operational and technical activities. Regarding age, the 31–40 age group was the largest (56.7%), followed by the 20–30 age group (29.8%), suggesting a strong representation of the productive workforce. In terms of length of service, respondents with 5–10 years of experience constituted the largest group (46.2%), while the majority of respondents held a bachelor’s degree (66.9%). Overall, the respondent profile reflects an experienced, highly educated, and productive population characteristics that support the validity of the research findings related to employee engagement and innovative work behavior in the electricity industry.

Table 3. Measurement Model (CFA).

	CR	AVE	Threshold Value (CR)	Threshold Value (AVE)	Remark
Transformational_Leadership_X	0,953	0,589	0.700	0.500	Reliable
Employee_Engagement_Z	0,946	0,575	0.700	0.500	Reliable
Innovative_Work_Behavior_Y	0,948	0,582	0.700	0.500	Reliable

The construct reliability (CR) of each latent variable exceeds the minimum reliability threshold ($CR \geq 0.70$), and the average variance extracted (AVE) exceeds the minimum required value (≥ 0.50). Therefore, it can be concluded that the observed (manifest) variables measuring each latent variable demonstrate sufficient reliability.

Structural Model

After completing the CFA process, structural equation modeling (SEM) analysis was conducted using IBM SPSS AMOS version 23. This SEM approach has also been widely employed in previous studies to examine direct and indirect relationships among the variables under investigation (Fulgence et al., 2023; Kucharska, 2022; D. Sharma & Sharma, 2024; R. K. Sharma & Kaur, 2024). The results of the analysis, pertaining to the testing of direct and indirect effects for the previously formulated hypotheses, are presented sequentially in the following table.

Table 4. Path Coefficients and C.R. (t-value, p-value).

			Estimate	Estimate	S.E.	C.R.	P
Innovative Work Behavior (Y)	<---	Transformational Leadership (X)	0,357	0,332	0,060	5,561	***
Innovative Work Behavior (Y)	<---	Employee Engagement (Z)	0,374	0,356	0,062	5,766	***
Employee Engagement (Z)	<---	Transformational Leadership (X)	0,468	0,459	0,065	7,057	***

Indirect effect: $0,468 \times 0,374 = 0,175$.

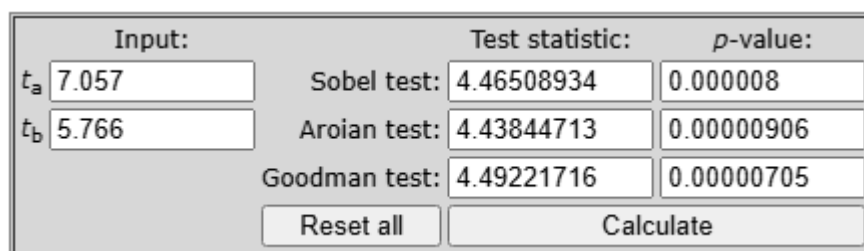


Figure 2. Sobel Test calculation of the indirect effect of X1 on Y through Z.

Direct Influence Analysis

The analysis results indicate that transformational leadership (X) has a positive and significant effect on innovative work behavior (Y), with a path coefficient of 0.357, a critical ratio (C.R.) of 5.561, and a p-value < 0.001. This suggests that the greater the implementation of transformational leadership, the higher the level of employees’ innovative work behavior. Furthermore, employee engagement (Z) was also found to have a positive

and significant effect on innovative work behavior (Y), with a path coefficient of 0.374, C.R. = 5.766, and p-value < 0.001. This indicates that higher employee engagement is associated with a greater tendency to exhibit innovative work behavior.

In addition, transformational leadership (X) was found to have a positive and significant effect on employee engagement (Z), with a path coefficient of 0.468, C.R. = 7.057, and p-value < 0.001. This implies that the more effectively transformational leadership is applied, the higher the level of employee engagement in their work.

Analisis Pengaruh Tidak Langsung (Mediasi)

Nilai pengaruh tidak langsung dihitung melalui perkalian antara pengaruh $X \rightarrow Z$ dan $Z \rightarrow Y$, yaitu $0,468 \times 0,374 = 0,175$. Hasil ini menunjukkan bahwa kepemimpinan transformasional berpengaruh secara tidak langsung terhadap perilaku kerja inovatif melalui employee engagement sebesar 0,175. Karena seluruh jalur signifikan (baik langsung maupun tidak langsung), maka dapat disimpulkan bahwa employee engagement memediasi secara parsial (partial mediation) hubungan antara kepemimpinan transformasional dan perilaku kerja inovatif. Dengan kata lain, kepemimpinan transformasional tidak hanya memengaruhi perilaku inovatif secara langsung, tetapi juga melalui peningkatan keterikatan karyawan.

Analysis of Indirect Influence (Mediation)

The indirect effect was calculated by multiplying the effects of $X \rightarrow Z$ and $Z \rightarrow Y$, yielding $0.468 \times 0.374 = 0.175$. This result indicates that transformational leadership indirectly influences innovative work behavior through employee engagement by 0.175. Since all paths are significant (both direct and indirect), it can be concluded that employee engagement partially mediates the relationship between transformational leadership and innovative work behavior. In other words, transformational leadership affects innovative work behavior not only directly but also indirectly through increased employee engagement.

DISCUSSION

This study examined the effects of transformational leadership, employee engagement, and innovative work behavior (IWB) using Structural Equation Modeling (SEM) with AMOS version 23. The results indicate that all relationships among the variables are positive and significant.

First, transformational leadership has a positive and significant effect on innovative work behavior (coefficient = 0.357; $t = 5.561 > 1.96$). This finding supports the theory of Bass & Riggio (2006) and aligns with prior studies by Gumusluoglu & Ilsev (2009), Alshahrani (2023), Umrani (2020), Tan et al. (2024), Afsar & Umrani (2020), and Nordin et al. (2024). In other words, higher levels of transformational leadership lead to stronger innovative work behaviors among employees. In the context of the electrical industry, this leadership style fosters idea generation, technological adaptation, and process efficiency improvements.

Second, employee engagement also has a positive and significant effect on innovative work behavior (coefficient = 0.374; $t = 5.766 > 1.96$). This finding is consistent with the theoretical foundations of Kahn (1990) and Schaufeli et al. (2002) and is supported by Zhang & Wang (2021) and Khan (2021). Employees with higher engagement levels demonstrate greater enthusiasm, dedication, and creativity in contributing to organizational innovation.

Third, transformational leadership directly influences employee engagement positively (coefficient = 0.468; $t = 7.057 > 1.96$). This result is consistent with Bass (1990) and supported by Saks (2006), Schaufeli & Bakker (2004), Jnaneswar & Ranjit (2022), Hooi & Chan (2023), Balwant et al. (2020), and Farzana & Charoensukmongkol (2024). Transformational leaders are able to foster a strong sense of meaning, motivation, and emotional involvement among employees, particularly in navigating industrial transformation and digitalization.

Fourth, there is a significant indirect effect of transformational leadership on innovative work behavior through employee engagement (coefficient = 0.175; $t = 4.465 > 1.96$). This indicates that employee engagement serves as a mediating variable that strengthens the relationship between transformational leadership and innovative behavior. This finding supports the results of Khan (2021), Khari & Bali (2024), Zia & Memon (2024), Kundi et al. (2023), and Wang et al. (2023), who emphasized that work engagement is a key psychological mechanism mediating the leadership innovation relationship.

Overall, the findings confirm that transformational leadership plays a dual role both directly and indirectly through employee engagement in promoting innovative work behavior. In the context of Indonesia's electrical industry, which is currently transitioning toward digitalization and green energy, this leadership style serves as a crucial factor in enhancing employee engagement, accelerating innovation adoption, and strengthening organizational competitiveness.

IMPLICATIONS

The results of this study indicate that transformational leadership plays a crucial role in enhancing employee engagement and innovative work behavior, which serve as fundamental drivers supporting the Indonesian electricity sector's transition toward a green industry.

For Transformational Leadership, the Individualized Consideration indicator recorded the highest score (4.083), reflecting leaders' personal attention and guidance toward subordinates. Implication: Leaders should maintain an empathetic approach and strengthen a culture of care to foster ownership of sustainability initiatives.

For Employee Engagement, the Absorption indicator achieved the highest score (4.058), illustrating employees' full involvement in their work. Implication: Organizations need to sustain this engagement by providing challenging and meaningful work, as well as opportunities to participate in energy efficiency and sustainability programs.

For Innovative Work Behavior, the Idea Generation indicator scored the highest (4.125), demonstrating employees' ability to generate ideas and contribute to continuous improvement. Implication: Organizations should provide platforms for innovation and reward systems for ideas that contribute to energy efficiency and emission reduction.

Overall, empathetic transformational leadership can foster employee engagement and innovation, which are key to accelerating the green industry transition and achieving Net Zero Emissions by 2060.

CONCLUSION

Based on the results of the study in Indonesia's electricity industry, it can be concluded that transformational leadership, employee engagement, and innovative work behavior are significantly and positively interrelated. Transformational leadership has a direct effect on innovative work behavior as well as an indirect effect through increased employee engagement. Visionary and inspiring leaders are able to foster motivation, a sense of ownership, and work enthusiasm, which ultimately encourage the generation of innovative ideas and solutions. The synergy between transformational leadership and employee engagement is a key factor in strengthening innovative work behavior in the electricity sector, which is currently transitioning toward a green industry.

As a follow-up, organizations are recommended to strengthen leaders' inspirational motivation through vision communication training and empathy-based coaching, enhance employees' enthusiasm and engagement through welfare programs and performance recognition, and promote the realization of innovative ideas with adequate resource support and mentoring systems. These efforts will reinforce an innovation culture and accelerate the electricity sector's transition toward a sustainable green industry.

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