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Green Transformational Leadership and Its Impact on Employee Work Engagement: An Exploratory Study of the opinions of a Sample of Employees at the Nineveh Education Directorate

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Abstract. Amongst increasing attention in administrative and leadership practices that support environmental advantages and adoptive employee engagement and integration within the office, this study objectives to classify the influence of green transformational leadership on the job engagement of employees at the Nineveh Education Directorate. The study discusses what should be known about the green transformational leadership and its role in boosting the job engagement of employees. For that matter, a descriptive-analytical strategy was adapted according to study nature and objectives, and the employees of Nineveh Education Directorate were considered as study population, and 80 employees were selected for the study. A questionnaire was the main tool for data collection; SPSS (Ver. 26) and (PLS- SEM) were used to analyse the data, using statistical techniques suitable for the data features and hypothesis testing. The study tests green transformational leadership as the independent variable and job engagement as the dependent variable, aiming to discover the nature of the relationship and effect between them. The results reveal the extent to which green transformational leadership dimensions are practiced and their impact on the job engagement of the sample members. Moreover, the study suggestions conclusions and recommendations to assist the Nineveh Education Directorate's management in strengthening green-oriented leadership practices, thereby supportive employee participation and increasing their level of engagement at work.

Keywords: Green Transformational Leadership, Job Engagement, Nineveh Education Directorate.

1. Introduction

Fast changes within modern organizations have required the advent of modern leadership styles skilled of managing and inspiring employees, in addition to adopting their engagement in achieving organizational objectives. In this situation, "Green Transformational Leadership" has occurred as a style that mixes transformational leadership principles with environmental directions; it does so by moving and motivating employees and steering their behavior toward adopting green practices (Yusliza et al., 2025). Latest studies have established that this leadership style is related to a variety of positive employee results, mostly environmentally concerned with behaviors and practices (Su and Hahn, 2025; Kaya and Atsan, 2025).

Equally, employee engagement attitudes as a vital notion in organizational behavior, replicating an employee's energy, commitment, and deep involvement in their work. Leadership plays a essential role in this area through its capability to effect employee motivations and attitudes, while enhancing their engagement and interaction with their work. A current study proved that green leadership is related both directly and indirectly to employee engagement through the medium of green organizational culture (Gao et al., 2026). Additional study recognized a relationship between green transformational leadership and work engagement, emphasizing the role of engagement in translating leadership practices into positive employee results (Oktaysoy, 2025). Despite rising concern in this tendency, new revisions have mainly absorbed on

Green work engagement and environmental-friendly behaviours are discussed here; also, it should be emphasised that the literature on the green transformational leadership role for normal employer engagement is still not complete, and most of it is available in the government and academic institutes. Therefore, the present study aims to fill this gap by investigating the impact of green transformational leadership on employee engagement in the Directorate of Education of Nineveh, uncovering the nature of the relationship between them and determining the extent to which the dimensions of green transformational leadership are involved in enhancing employee engagement. The study is divided into three joined sections, the first is the theoretical framework and previous studies, the second is the methodology, fieldwork procedures, data analysis, and hypothesis testing, and the third is the discussion of results, conclusions, and commendations and proposals for future study.

2. Theoretical Framework and Hypotheses

2.1 Green Transformational Leadership

Over the previous two eras, transformational leadership has held a position of high significance within the field of leadership studies (Liu and Yu, 2023). Green transformational leadership signifies a recent tendency in leadership thought, developing from the combination of transformational leadership principles with environmental alignments; its goal is to monitor employees near accepting an organizational vision that highlights the environmental dimension.
This leadership style trusts on the leader's capability to effect, inspire, and motivate employees to go outside the supplies of their immediate job roles, guiding this impact toward completing the organization's green goals and practices. Green transformational leadership is famed by its capacity to build a shared environmental vision, foster environmental awareness, and encourage employees to devise innovative ways to address environmental challenges within the organization (Yusliza et al., 2025). The attendance of green transformational leadership with its unique features effectively inspires employees and improves their participation in environmental advantages, thereby establishment their loyalty and organizational commitment. Also, it encourages the organization's appearance as a socially and environmentally accountable object, improving its reputation and stakeholder relationships; this fosters greater trust and loyalty, finally ornamental business relatives between the organization and all its connections.

Green transformational leadership comprises four dimensions: green ideal influence, green intellectual stimulation, green individual consideration and green inspirational motivation (Bni Aissa and Aljaafreh, 2026).

2.2 Employee Engagement

Job engagement is a main idea in organizational behavior, reproducing the degree to which an employee is involved in and connected to their work across physical, cognitive, emotional, and behavioral dimensions. Involved employees are branded by high energy, a strong connection to their work, and the capability to achieve jobs efficiently.

Saks and Gruman defined job engagement as a multidimensional construct encompassing physical, cognitive, emotional, and behavioral aspects; engaged employees exhibit high energy, work attachment, and the ability to perform tasks efficiently. Furthermore, engagement levels are influenced by the availability of personal and job-related resources such as self-efficacy, resilience, social support, feedback, and development opportunities as well as by leadership practices and a focus on employee health and well-being. This occurs when individuals realize that their job roles play a pivotal part in meeting their expectations and achieving the goals they are working toward whether personal or organizational.

In particular, Gallup (2016) stated that high work engagement is related to the fact that employees know that their work and the tasks are important; this point is necessary for engagement with the activities and retention of the employees (Gandhi and Robison, 2021). It was also discovered in the study that employees are more engaged in their work if they feel that their work is meaningful and purposeful (Ahmed et al., 2016), viewing their work as playing a significant role in life and serving both their personal goals and those of their organization. Additionally, numerous studies across various organizations have confirmed that the nature of the work itself is a fundamental factor in work engagement and a catalyst for increased employee participation. Meaningful work was found to have a statistically significant positive link with work engagement in some studies (Fouché et al., 2017; Van Wingerden & Poell, 2019). Likewise, a statistically significant moderately strong positive work meaningful transformational work relationship was reported by (Karataş and Özdemir, 2022) Meaningful work leads to a sense of being significant, belonging, and job satisfaction of employees, motivating them to engage actively and

thereby enhancing their work engagement. A study by Khusanova, Kang, and Choi ,2021) identified a positive relationship between work and job engagement (Li et al., 2024). Accordingly, job engagement is understood as a state characterized by active participation, Feeling the importance of work, belonging, and job satisfaction (Gandhi and Robison, 2021; Li et al., 2024).

2.3 The Relationship Between Green Transformational Leadership and Employee Engagement

Previous research has revealed that green transformational leadership and green human resource management (GHRM) practices play a crucial role in shaping employees' environmental behavior. However, earlier studies adopted a dual approach to examining the effects of green transformational leadership and GHRM, often overlooking their combined impact (Peng et al., 2020).
In addition, green transformational leadership had a significant influence on green organizational identity and green organizational achieved mediation in the relationship between green transformational leadership and green creativity (Al-Ghazali et al., 2022).

Furthermore, Suliman et al. (2023) has investigated the influence of green transformational leadership on employees' environmental performance and green work engagement in the hotel business.

Based on the foregoing, the researchers examined the relationship between green transformational leadership and employee engagement among the staff of the Nineveh Directorate of Education in Iraq.

Accordingly, the following hypotheses were formulated:

H1: There is a significant correlation between green transformational leadership and job engagement of employees in the researched organization.
H1.1: There is a significant correlation between dimensions of green transformational leadership (individually) and job engagement of employees (combined) in the researched organization.
H2: There is a significant effect of the green transformational leadership on the job engagement of employees in the researched organization.
H2.1: There is a significant effect of the dimensions of green transformational leadership (individually) on the job engagement of employees (combined) in the researched organization.

2.4 Proposed Conceptual Framework

Developing a theoretical model required a rigorous review of the relevant literature and the formulation of preliminary hypotheses. Given that a single existing model could not fully explain the study context, the researchers developed a conceptual model based on a framework incorporating the key components of green transformational leadership and work engagement (Figure 1). Furthermore, the dimensions of green transformational leadership included: green idealized influence, green inspirational motivation, green individual considerations, and green intellectual stimulation (Bni Aissa and Aljaafreh, 2026). The elements of work engagement were derived from studies addressing active participation, feeling the importance of work, belonging, and job satisfaction (Al-Zaboun et al., 2023).

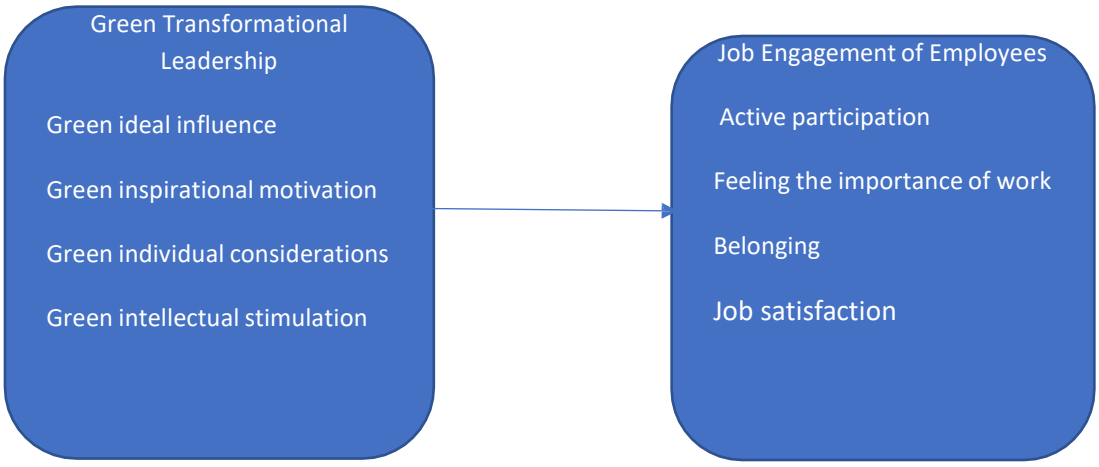

Figure 1: Conceptual Framework

Methodology and Findings:

Methodology:

The researchers implemented a quantitative research technique in the study. All data was collected from the employees working in the Nineveh education directorate in Iraq. The researchers implemented a conceptual framework for determining the relationship between the green transformational leadership and job engagement of employees. They distributed the survey questionnaires physically to the randomly-selected respondents. The questionnaires were written in the Arabic languages. The questionnaires included 4 sections; Section 1 included questions related to the demographic information of the respondents; Section 2 covered the green transformational leadership dimensions (16 items); Section 3 highlighted the job engagement of employees (16 items). These questionnaires were distributed amongst 100 employees. Out of the 80 questionnaires that were collected, 20 were filled (i.e., 80%) Thereafter, these were categorised and analysed. Thus, it was concluded that the employees were willing to share information with the researchers which increased their trust in the data.

Findings:

Data Presentation and Analysis

First: Descriptive Analysis of the Questionnaire Items

"Calculation of Frequency, Percentage, Relative Importance Index, Mean, SD, and Relative Importance of All Items for Dimensions of Questionnaire".

1- Descriptive Analysis of Items for the "Green Transformational Leadership" Variable Dimensions:
Frequencies, percentages, arithmetic means, standard deviations, and response rates were calculated for the dimensions of the "Green Transformational Leadership" variable, as shown in the tables below:

a. Analysis of "Green Idealized Influence" Items:

Table (1): Analysis and Description of Items Green Ideal Effect

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
GIE_1	38	47.5	40	50.0	2	2.5	0	0.0	0	0.0	4.450	0.549	89.0
GIE_2	37	46.2	38	47.5	5	6.3	0	0.0	0	0.0	4.400	0.608	88.0
GIE_3	31	38.8	47	58.7	2	2.5	0	0.0	0	0.0	4.362	0.534	87.3
GIE_4	30	37.5	43	53.7	7	8.8	0	0.0	0	0.0	4.287	0.620	85.8
GIE	42.5%		52.5%		5.0%		0.0%		0.0%		4.375	0.578	87.5%
	95.0%						0.0%						

Table (1) shows that the "Green Ideal Effect" dimension represented by items GIE_1 through GIE_4 achieved an agreement rate ("Strongly Agree" and "Agree") of 95.0% among the total sample, while the disagreement rate ("Disagree" and "Strongly Disagree") was 0.0%, and the neutral response rate was 5.0%. These outcomes are stayed by a mean score of 4.375, a standard deviation of 0.578, and a response rate of 87.5%, specifying a high level of awareness among sample members concerning Green Ideal Influence practices. Item GIE_1"The manager acts in a manner that earns the trust of the directorate's employees" recorded the highest mean score at 4.450, with a standard deviation of 0.549 and a response rate of 89.0%.
a. Analysis of "Green Inspirational Motivation" items:

Table (2): Item and Analysis Green Inspirational Motivation/Encouragement

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
GIM_1	20	25.0	54	67.5	6	7.5	0	0.0	0	0.0	4.175	0.546	83.5
GIM_2	20	25.0	54	67.5	6	7.5	0	0.0	0	0.0	4.175	0.546	83.5
GIM_3	24	30.0	51	63.7	5	6.3	0	0.0	0	0.0	4.237	0.557	84.8
GIM_4	24	30.0	48	60.0	8	10.0	0	0.0	0	0.0	4.200	0.604	84.0
GIM	27.5%		64.7%		7.8%		0.0%		0.0%		4.197	0.563	83.9%
	92.2%						0.0%						

Regarding Table (2): The GIM dimension (GIM_1 to GIM_4) has a rate of 86.7% of the sample (Strongly Agree + Agree) and a rate of 0.0% of disagreement and finally 7.8% of neutral. This is evidenced by a mean of 4.197, a standard deviation of 0.563, and a response rate of 83.9%. The item with the highest mean was GIM_3 "The directorate management provides group rewards to the employees periodically to build team spirit" with a mean of 4.237, a standard deviation of 0.557, and a response rate of 84.8%.

a. Analysis of "Green Individual Considerations" items:

Table (3): Analysis and Description of "Green Individual Considerations" items

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
GIC_1	22	27.5	54	67.5	4	5.0	0	0.0	0	0.0	4.225	0.527	84.5
GIC_2	24	30.0	54	67.5	2	2.5	0	0.0	0	0.0	4.275	0.503	85.5
GIC_3	26	32.5	52	65.0	2	2.5	0	0.0	0	0.0	4.300	0.513	86.0
GIC_4	27	33.8	49	61.2	4	5.0	0	0.0	0	0.0	4.287	0.556	85.8
GIC	31.0%		65.3%		3.7%		0.0%		0.0%		4.272	0.525	85.4%
	96.3%						0.0%						

Table (3) displays that the "Green Individual Considerations" dimension signified by items GIC_1 through GIC_4 received an agreement rate ("Strongly Agree" and "Agree") of 96.3% among the total sample, while the disagreement rate ("Disagree" and "Strongly Disagree") was 0.0%, and the neutral response rate was 3.7%. These outcomes are stayed by a mean score of 4.272, a standard deviation of 0.525, and a response rate of 85.4%. Item GIC_3 which states, "The directorate's management esteems the environmental beliefs of employees" achieved the highest mean score at 4.300, with a standard deviation of 0.513 and a response rate of 86.0%.

a. Analysis of "Green Intellectual Stimulation" items:

TTable (4): Features and Analysis of "Green Intellectual Stimulation" from Items

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
GIS_1	19	23.8	57	71.2	4	5.0	0	0.0	0	0.0	4.188	0.506	83.8
GIS_2	20	25.0	52	65.0	8	10.0	0	0.0	0	0.0	4.150	0.576	83.0
GIS_3	26	32.5	50	62.5	4	5.0	0	0.0	0	0.0	4.275	0.551	85.5
GIS_4	22	27.5	51	63.7	7	8.8	0	0.0	0	0.0	4.188	0.576	83.8
GIS	27.2%		65.6%		7.2%		0.0%		0.0%		4.200	0.552	84.0%
	92.8%						0.0%						

Similarly, the dimension of "Green Intellectual Stimulation" (GIS_1, GIS_2, GIS_3 and GIS_4) was found to have a total agreement (Strongly Agree and Agree) of 92.8%, a total disagreement of 0.0% and a neutral of 7.2%, as shown in Table (4). It was represented by a mean of 4.200, a standard deviation of 0.552, and a response rate of 84%. The item GIS_3 "The directorate management tries to build up the efficiency of employees by arranging training programs" was the highest mean of 4.275 (SD=0.551; response rate=85.5%).

1- Descriptive analysis of the items for the "Job Engagement of Employees" variable dimensions:
Frequencies, percentages, means, standard deviations, and response rates were calculated for the dimensions of the "Job Engagement of Employees" variable, as shown in the tables below:
a. Analysis of the items of "Active Participation":

Table (5) Items of "Active Participation" analysis and description

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
AP_1	23	28.8	51	63.7	6	7.5	0	0.0	0	0.0	4.213	0.567	84.3
AP_2	32	40.0	46	57.5	2	2.5	0	0.0	0	0.0	4.375	0.537	87.5
AP_3	25	31.2	54	67.5	1	1.3	0	0.0	0	0.0	4.300	0.488	86.0
AP_4	28	35.0	50	62.5	1	1.3	1	1.3	0	0.0	4.312	0.565	86.3
AP	33.8%		62.8%		3.1%		0.3%		0.0%		4.300	0.539	86.0%
	96.6%						0.3%						

The findings on table (5) indicated that 96.6% of total sample (Strongly agree and agree) while 0.3% of the sample disagreed (Disagree and Strongly Disagree) in AP_1, AP_2, AP_3, and AP_4 on "Active Participation" whereas the remaining members of the sample constituting a proportion of 3.1% had a neutral opinion. These results are reflected in a mean score of 4.300, a S.D. of 0.539, and a response rate of 86.0%. HM_2: "I continuously apply new ideas/initiatives" had the highest mean score among treatment items at 4.375, with a standard deviation of 0.537 and a response rate of 87.5%.
a. Experience Real Significance of Work

Table (6): Analysis and Description of "Feeling the Importance of Work" items

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
FIW_1	20	25.0	54	67.5	6	7.5	0	0.0	0	0.0	4.175	0.546	83.5
FIW_2	24	30.0	52	65.0	4	5.0	0	0.0	0	0.0	4.250	0.540	85.0
FIW_3	24	30.0	49	61.3	7	8.7	0	0.0	0	0.0	4.213	0.589	84.3
FIW_4	30	37.5	44	55.0	6	7.5	0	0.0	0	0.0	4.300	0.604	86.0
FIW	30.6%		62.2%		7.2%		0.0%		0.0%		4.235	0.570	84.7%
	92.8%						0.0%						

Table (6) shows that the dimension Feeling the Importance of Work (FIW_1-FIW_4) covers Disagree and Strongly Disagree (0.0%), Strongly Agree and Agree (92.8%), and Neutral (7.2%) for all samples. As demonstrated by the mean score of 4.235, standard deviation of 0.570, and response rate of 84.7%. The respective training item (FIW_4) 'I get enough and regular training so I can do the work' was characterised by the highest average of 4.300 (standard deviation 0.604) and rate of response of 86.0%.
a. Analysis of "Belonging" items:

Table (7): Analysis and Description of "Belonging" items

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
B_1	32	40.0	44	55.0	4	5.0	0	0.0	0	0.0	4.350	0.576	87.0
B_2	32	40.0	44	55.0	4	5.0	0	0.0	0	0.0	4.350	0.576	87.0
B_3	36	45.0	40	50.0	4	5.0	0	0.0	0	0.0	4.400	0.587	88.0
B_4	33	41.2	44	55.0	3	3.8	0	0.0	0	0.0	4.375	0.560	87.5
B	41.5%		53.8%		4.7%		0.0%		0.0%		4.369	0.575	87.4%
	95.3%						0.0%						

Table 7 shows the items B_1-B_4 (Belonging). The agreement rate (Strongly Agree + Agree) is 95.3% of the whole sample with 0.0% disagreement rate (Disagree + Strongly Disagree) and 4.7% neutral response rate. Average certified by the following:

The greatest mean of 4.400, SD = 0.587, 88.0% response rate was obtained for the item B_3 "I feel comfortable with the work team to which I belong."
a. Analysis of Job Satisfaction items:

Table (8): Analysis and Description of Job Satisfaction items

Items	Response Scale										Mean	Standard Deviation	Relative Importance (%)
	Strongly Agree)5(		Agree (4)		Neutral (3)		Disagree (2)		Strongly Disagree (1)				
	F	%	F	%	F	%	F	%	F	%			
JS_1	26	32.5	50	62.5	4	5.0	0	0.0	0	0.0	4.275	0.551	85.5
JS_2	25	31.3	51	63.7	4	5.0	0	0.0	0	0.0	4.263	0.545	85.3
JS_3	31	38.8	45	56.2	3	3.7	1	1.3	0	0.0	4.325	0.612	86.5
JS_4	30	37.5	45	56.2	5	6.3	0	0.0	0	0.0	4.312	0.587	86.3
JS	35.0%		59.7%		5.0%		0.3%		0.0%		4.294	0.574	85.9%
	94.7%						0.3%						

Table (8) shows that the "Job Satisfaction" dimension represented by items JS_1 through JS_4 received an agreement rate ("Strongly Agree" and "Agree") of 94.7% among the total sample, while the disagreement rate ("Disagree" and "Strongly Disagree") was 0.3%, and the neutral response rate was 5.0%. These results are supported by a mean of 4.294, a standard deviation of 0.574, and a response rate of 85.9%. Item JS_3 which states, "I have noticed an improvement in my job performance since joining the organization"—achieved the highest mean score of 4.325, with a standard deviation of 0.612 and a response rate of 86.5%.

Model Evaluation Metrics
PLS-SEM is one of the appropriate statistical views that fit testing relations of latent variables and will be applied in the assessment of the model of this study after descriptive data analysis. The model evaluation is a two-stage procedure. The first stage involves measuring model evaluation, which attempts to test the quality and reliability of measurement instruments in the study and the validity and reliability of correlations between latent variables and their indicators. The second stage comprises testing the structural model, which tests the causal linkages between latent variables, estimates the strength and direction of such relationships, and tests the hypotheses of the study using the Smart-PLS 3 software.

1. Assessing the Measurement Model:
This stage checks the stability and validity of variables and indicators. The reliability of items and dimensions for the study in the above tables (9) and (10) indicates that:

Table (9): Evaluation criteria for the "Green Transformational Leadership" variable model

Latent Variables	Items	Outer Loading		Internal Consistency		
		≥ 0.7	Remain?	AVE≥0.5	Cronbach's Alpha ≥0.7	Composite Reliability ≥0.7
Green Ideal Effect	GIE_1	0.822	Yes	0.603	0.780	0.859
	GIE_2	0.739	Yes			
	GIE_3	0.747	Yes			
	GIE_4	0.796	Yes			
Green Inspirational Motivation	GIM_1	0.858	Yes	0.706	0.858	0.905
	GIM_2	0.883	Yes			
	GIM_3	0.886	Yes			
	GIM_4	0.722	Yes			
Green Individual Considerations	GIC_1	0.788	Yes	0.683	0.844	0.896
	GIC_2	0.852	Yes			
	GIC_3	0.885	Yes			
	GIC_4	0.777	Yes			
Green Intellectual Stimulation	GIS_1	0.721	Yes	0.582	0.759	0.848
	GIS_2	0.835	Yes			
	GIS_3	0.728	Yes			
	GIS_4	0.764	Yes			
Green Transformational Leadership				0.542	0.908	0.921

Table (10): Evaluation criteria for the model regarding the "Job Engagement of Employees" variable.

Latent Variables	Items	Outer Loading		Internal Consistency		
		≥ 0.7	Remain?	AVE≥0.5	Cronbach's Alpha ≥0.7	Composite Reliability ≥0.7
Active Participation	AP_1	0.773	Yes	0.676	0.839	0.893
	AP_2	0.838	Yes			
	AP_3	0.867	Yes			
	AP_4	0.806	Yes			
Feeling the Importance of Work	FIW_1	0.810	Yes	0.669	0.835	0.890
	FIW_2	0.808	Yes			
	FIW_3	0.851	Yes			
	FIW_4	0.803	Yes			
Belonging	B_1	0.787	Yes	0.642	0.814	0.878
	B_2	0.774	Yes			
	B_3	0.834	Yes			
	B_4	0.809	Yes			
Job Satisfaction	JS_1	0.852	Yes	0.700	0.855	0.902
	JS_2	0.892	Yes			
	JS_3	0.879	Yes			
	JS_4	0.710	Yes			
Job Engagement of Employees				0.544	0.915	0.927

The results in Tables (9) and (10) show that the measurement model is valid and reliable. The outside loadings were varied from 0.710 to 0.892 in which all values were above the permissible limit of 0.70; hence, all the items were retained. Average variance extracted (AVE) ranged from 0.542 to 0.706, confirming convergent validity, since all were over 0.50. Cronbach's Alpha ranged from 0.759 to 0.915 exceeding the value of 0.70, Composite Reliability scores ranged from 0.848 to 0.927 also exceeding the value of 0.70 indicating internal consistency and reliability. Hence, the measurement model was adequate to proceed to structural model evaluation and research hypothesis testing.

Discriminant validity is one of the criteria for assessing the measurement model, which seeks to determine if the latent variable can be discriminated from other latent variables and that a set of indicators used to measure one variable cannot be used for measuring another variable. In this study, HTMT, one of the most common criteria to evaluate the discriminant validity in the PLS-SEM approach, was adopted to check this criterion. The findings of this criterion are in Table (11) which shows that the values of the HTMT are all below the threshold value of 0.90. This indicates the discriminant validity of the study variables, which means that each latent variable is sufficiently distinct from other latent variables and assesses the notion that it is intended to measure.

Table (11): HTMT criterion results

Latent Variables	GIE	GIM	GIC	GIS	GTL	AP	FIW	B	JS	JEE
GIE	—									
GIM	0.476	—								
GIC	0.717	0.692	—							
GIS	0.804	0.559	0.791	—						
GTL	0.840	0.786	0.713	0.799	—					
AP	0.763	0.620	0.622	0.751	0.798	—				
FIW	0.689	0.604	0.676	0.717	0.780	0.816	—			
B	0.702	0.515	0.518	0.813	0.733	0.755	0.646	—		
JS	0.368	0.560	0.350	0.423	0.499	0.430	0.669	0.594	—	
JEE	0.740	0.678	0.637	0.793	0.826	0.813	0.798	0.843	0.848	—

1- Evaluation of the Structural Model

Having established the measurement model as reliable and valid, the next step was to estimate the structural model. Here, the cause-effect correlations between the latent variables are evaluated and the study hypotheses are tested. This includes testing the explanatory and predictive power of the model (using a set of statistical indicators as detailed below: primarily effect size f2 and coefficient of determination R2) and testing for the presence of multicollinearity between the variables by Variance Inflation Factor (VIF). The findings of these indicators are shown below:

a. Variance Inflation Factor (VIF)

Table (12): Variance Inflation Factors

Items	VIF	Items	VIF	Items	VIF	Items	VIF
GIE_1	1.750	GIC_1	1.617	AP_1	1.501	B_1	1.876
GIE_2	1.443	GIC_2	2.442	AP_2	2.110	B_2	1.821
GIE_3	1.468	GIC_3	2.839	AP_3	2.288	B_3	2.123
GIE_4	1.586	GIC_4	1.601	AP_4	1.861	B_4	2.000
GIM_1	2.491	GIS_1	1.374	FIW_1	1.763	JS_1	2.228
GIM_2	2.612	GIS_2	1.861	FIW_2	1.717	JS_2	2.867
GIM_3	2.840	GIS_3	1.361	FIW_3	2.069	JS_3	2.646
GIM_4	1.410	GIS_4	1.558	FIW_4	1.741	JS_4	1.568

As can be shown in Table (12), VIF values for all indicators of the study were between 1.361 and 2.867. These values are all less than the tolerable against 5.00 showing that the indicators did not suffer from a substantial multicollinearity problem. Thus, the model meets the multicollinearity criterion, which implies that one can proceed to calculate relationships in the structural model and test hypotheses of the study.

b. Model Quality Assessment
Model quality will be assessed based on both R^2 and F^2; Table (13) presents the values for these criteria.

Table (13): Model Quality Criteria Values

Latent Variables	R^2	Explanatory Power	f^2	Effect Size
GIE	0.620	Moderate	1.630	Large
GIM	0.571	Moderate	1.334	Large
GIC	0.769	Substantial	3.338	Large
GIS	0.682	Moderate	2.144	Large
AP	0.703	Moderate	2.368	Large
FIW	0.749	Moderate	2.978	Large
B	0.665	Moderate	1.981	Large
JS	0.541	Moderate	1.181	Large
JEE	0.574	Moderate	1.349	Large

The value of R2 was between 0.541-0.769 suggesting a moderate to high explanatory power as seen in Table (13). The GIC dimension had the highest value (0.769) in the "substantial" explanatory power range, while the others fell in the "moderate" range. The f^2 values were between 1.181 and 3.338, considered "large" effects. These results so imply that a linear structural model with substantial effects can sufficiently explain all the variables in the model.

Testing Correlation and Influence Hypotheses:

The fit of the model indexes were checked to ascertain that the study model had been well fitted according to the requirements of the sample data. Consequently, we can now proceed to test the study hypotheses provided in the methodology section, as follows:

First: Testing Correlation Hypotheses

The pulmonary pre-judgement for the first major hypothesis was using SPSS 26's Spearman's correlation coefficient. The outcomes were:

1.Testing the First Main Hypothesis
Thus, the first of the primary hypotheses is tested here, namely:
There is no substantial relationship between green transformational leadership and employee job engagement in the studied organization.
Table 14: Correlation Between Green Transformational Leadership and Employee Job Engagement

Table (14): Correlation Analysis between Green Transformational Leadership and Employee Job Engagement

Variables	Job Engagement of Employees			
Green Transformational Leadership	Correlation Coefficient	CI (95%)		P-Value
		Lower	Upper	
	0.649	0.484	0.770	<0.001

The correlation test between Green Transformational Leadership and job engagement of the employees is explained in Table (14) using Spearman correlation coefficient. The results suggest a statistically significant positive correlation between the two variables, $r = 0.649$ ($p < 0.001$). Additionally, the 95% confidence interval ranged from 0.484 to 0.770, which does not contain zero and corroborates the significance of the association. Therefore, the hypothesis of statistically significant link that exists between green transformational leadership and employee work engagement at the studied business is accepted.

1.Testing the sub-hypothesis of the first main hypothesis
Here, the sub-hypothesis of the first main hypothesis is tested, which states:
(There is a significant correlation between dimensions of green transformational leadership (individually) and job engagement of employees (combined) in the researched organization).

Table (15): Correlation between the aspects of green transformational leadership and employee job engagement

Table (15) Correlation of green transformational leadership qualities with the variable of employee work engagement.

Variables	Engagement of Employees			
	Correlation Coefficient	CI (95%)		P-Value
		Lower	Upper	
Green Ideal Effect (GIE)	0.613	0.438	0.743	<0.001
Green Inspirational Motivation (GIM)	0.485	0.285	0.644	<0.001
Green Individual Considerations (GIC)	0.454	0.250	0.620	<0.001
Green Intellectual Stimulation (GIS)	0.540	0.349	0.687	<0.001

Table 15. Spearman correlation between aspects of Green Transformational Leadership and job engagement of employees. The results indicated that all dimensions were positively and significantly correlated ($r = 0.454–0.613$, $p < 0.001$). Moreover, the 95% confidence intervals did not include zero. The strongest relationship with job engagement is seen for the GIE dimension ($r = 0.613$), and the poorest relationship is observed for the GIC dimension ($r = 0.454$). Therefore, the hypotheses are accepted.

Second: Testing the Influence Hypotheses

To verify and validate the impact hypotheses, we developed PLS-SEM models using Smart-PLS 3 software to either confirm or refute the hypothesis, as follows:

1.Testing the second main hypothesis, which states:
(There is not a significant effect of green transformational leadership on the job engagement of employees in the researched organization).

The model diagram of this hypothesis is shown in Figure (1) and the findings of structural model analysis (related to the acceptance of the second primary hypothesis) are shown in Table (16).

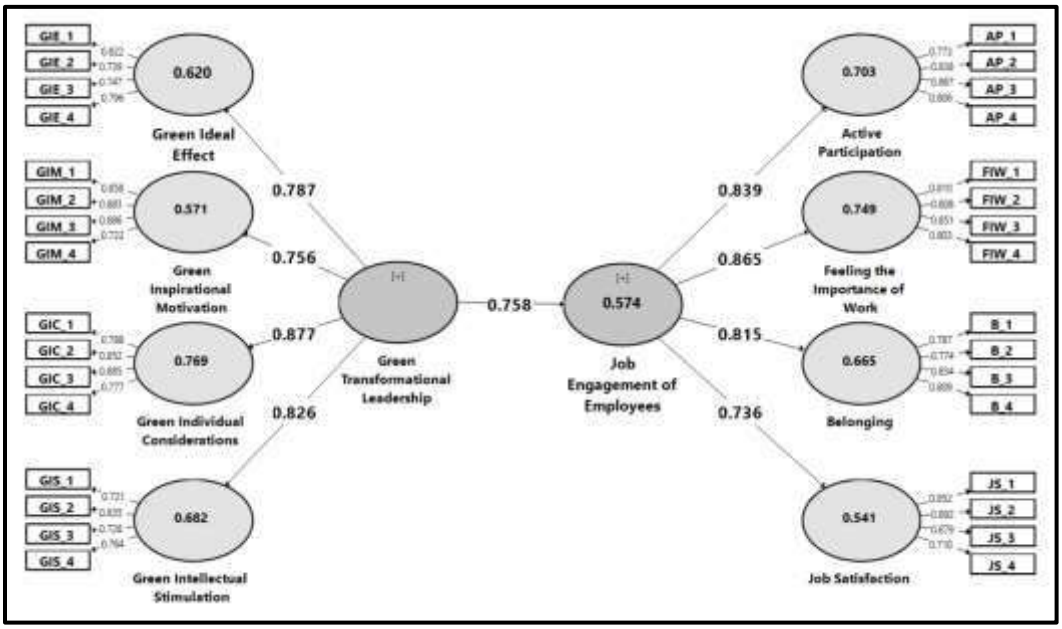

Figure (1): *The effect of green transformational leadership on employee job engagement*

Table (16): The effect of green transformational leadership on employee job engagement

Path	Original Sample (β)	Standard Deviation	T Statistic	P-Value	CI (95%)		R^2
					Lower	Upper	
GTL →JEE	0.758	0.058	13.02	<0.001	0.633	0.856	0.574

In Table (16) the results indicate a positive and substantial influence of GTL on JEE with a value of path coefficient as β = 0.758, T-value = 13.020, and p = 0.000 (***) showing significance at 1% level. Moreover, the 95% confidence interval [0.633, 0.856] did not include zero, which supports the significance of the effect. The R^2 (coefficient of determination) was 0.574, suggesting that 57.4% of the variance in employee work engagement is explained by Green Transformational Leadership. Therefore, green transformational leadership had a significant effect on employee job engagement, and thus, the hypothesis was accepted.

1.Testing the sub-hypothesis of the second main hypothesis, which states:
(There is a significant effect of the dimensions of green transformational leadership (individually) on the job engagement of employees (combined) in the researched organization).

Figure (2) The model diagram of this hypothesis is shown in, and the findings of test on the Green Transformational Leadership dimensions' effects on employee work engagement are shown in Table (17)

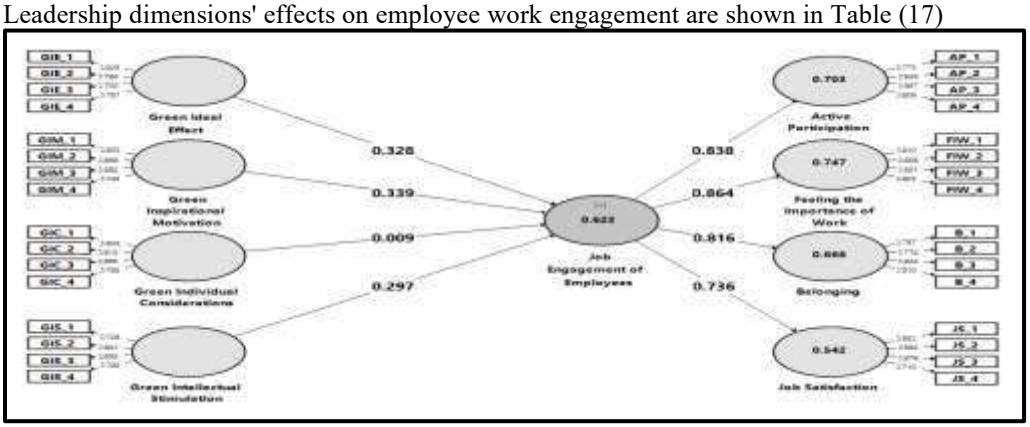

Figure (2): *The impact of green transformational leadership dimensions on employee job engagement*

Table (17): The impact of green transformational leadership dimensions on employee job engagement

Path	Original Sample (β)	Standard Deviation	T Statistic	P-Value	CI (95%)		R^2
					Lower	Upper	
GIE →JEE	0.328	0.105	3.133	0.002	0.110	0.517	0.623
GIM →JEE	0.339	0.103	3.295	0.001	0.126	0.530	
GIC →JEE	0.009	0.127	0.074	0.941	-0.222	0.265	
GIS →JEE	0.297	0.127	2.344	0.019	0.050	0.537	

Table (17) shows the test findings of the effect of all four characteristics of green transformational leadership on the job engagement by the employees. Results revealed a positive and significant effect of the dimensions of Green Ideal Effect (GIE; β = 0.328, p = 0.002), Green Inspirational Motivation (GIM; β = 0.339, p = 0.001), and Green Intellectual Stimulations (GIS; β = 0.297, p = 0.019), where the corresponding confidence intervals did not include zero value. However, the effect of the GIC dimension on job engagement was not significant (β = 0.009, p = 0.941; CI containing zero).

The greatest contribution was found to be the green inspirational motivation (GIM) dimensions, followed by green ideal effect (GIE) and green intellectual stimulation (GIS), and green individual considerations (GIC) had no independent explanatory contribution toward work engagement of the employees if other dimensions were incorporated into the model. This means that the 4 aspects of green transformational leadership explain 62.3% of the variance in work engagement. The GIE, GIM, and GIS dimensions are therefore exceptions for the null hypothesis, which is then rejected, and this partially supported the alternative hypothesis but not for the GIC dimension.

Conclusions and Discussion:

The results noted in this study highlighted the positive relationship between green transformational leadership and job engagement of employees. It was also noted that green transformational leadership has a positive effect on job engagement of employees.
There is limited empirical evidence regarding the relationship between green transformational leadership and job engagement of employees. Very few studies were examined this relationship, as Gao and Yue (2026) have investigated the impact of green leadership on employee work engagement and green behaviour: the mediating role of green organizational culture.

This was one of the first studies that attempted to investigate these variables in the Nineveh Education Directorate. Hence, the results of this study could fill the gap existing in the empirical data regarding green transformational leadership. In this study, the researchers used green transformational leadership as an independent variable, while the earlier studies considered green transformational leadership as the independent variable Kaya and Atsan, (2025) have investigated the influence green transformational leadership on employee green behavior with the mediating role of green intrinsic motivation and the study of Gao and Yue (2026).

Currently, job engagement of employees is achieved through green transformational leadership by setting an environmental example. This approach not only fosters employee motivation and inspiration but also links that motivation to the organization's sustainable environmental goals. In this study, the researchers have investigated the relationship between the green transformational leadership and job engagement of employees. Here, the data has offered empirical support which highlighted the effect of green transformational leadership on job engagement of employee. Further research could provide a better understanding and support for the effect of green transformational leadership on job engagement of employees.

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