A Model of Green Management Success in Iron and Steel Enterprises in China

Li WuJjun[1] and Karnjira Limsiritong[2]

School of Management, Siam University, Thailand

Corresponding Author, E-mail: [1]wujjun4@gmail.com

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Abstract

This study explores the impact of green transformational leadership on employee green behavior in Chinese iron and steel enterprises, with green organizational culture and green self-efficacy as mediating variables. Drawing on Transformational Leadership Theory, Social Cognitive Theory, Theory of Planned Behavior, and Sustainable Development Theory, a structural model was proposed. A mixed-methods approach was adopted, involving 532 valid survey responses and interviews with 12 experts from enterprises, government, and the green industry. Structural equation modeling (SEM) results show that green transformational leadership significantly affects employee green behavior, and this relationship is partially mediated by green organizational culture and green self-efficacy. The findings contribute to the theoretical development of green leadership and provide practical implications for promoting sustainable practices in high-emission industries

Keywords: Green Transformational Leadership; Employee Green Behavior; Green Organizational Culture; Green Self-Efficacy; Sustainability; Chinese Iron and Steel Enterprises

Introduction

In recent decades, China's rapid industrialization has brought not only economic growth but also significant environmental challenges. The iron and steel sector, a cornerstone of China's economy, is also one of the most resource-intensive and polluting industries (Zhang, Liu, & Wang, 2023; Liu & Zhang, 2020; Wu & Zhang, 2021). In response to escalating climate concerns and national carbon

neutrality goals, iron and steel enterprises are under increasing pressure to adopt green management practices (Zhao, Gao, Wu, Wang, & Zhu, 2021; Sachs, 2015; Drexhage & Murphy, 2010).

Leadership plays a pivotal role in driving organizational transformation (Bass, 1985; Burns, 1978; Bansal & DesJardine, 2014). However, limited empirical research has examined how green leadership, particularly green transformational leadership, influences employee green behavior (Robertson & Barling, 2013; Mittal & Dhar, 2016; Chen & Chang, 2013; Ahmad et al., 2021). This study addresses this gap by investigating the mediating roles of green organizational culture and green self–efficacy in shaping green behavior among employees in the Chinese iron and steel enterprises (Ren, Tang, & Jackson, 2021; Zhang & Dong, 2022; Yong, Ren, & Tang, 2020; Tabernero & Hernández, 2011; Li, Wang, & Lin, 2020).

Research Objectives

1. Finding out the current situations of Green Management success in iron and steel enterprise.
2. Finding out more effective approaches to innovate Green Management success in iron and steel enterprise.

Literature Review

This study is grounded in four major theories. Transformational Leadership Theory explains how leaders inspire change through vision, motivation, and support (Bass, 1985; Burns, 1978; Ahmad et al., 2021; Mittal & Dhar, 2016). Social Cognitive Theory highlights the role of self–efficacy in behavioral change (Bandura, 1986; Tabernero & Hernández, 2011; Li, Wang, & Lin, 2020). The Theory of Planned Behavior underscores the influence of attitudes, norms, and perceived control on intentions and behavior (Ajzen, 1991; Lamm, Tosti–Kharas, & Williams, 2013). Sustainable Development Theory provides a macro–framework emphasizing the balance between economic growth, environmental protection, and social equity (Drexhage & Murphy, 2010; Sachs, 2015; Dyllick & Muff, 2016; Bansal & DesJardine, 2014; Epstein & Buhovac, 2014; Lozano, 2012).

Green transformational leadership integrates environmental values into leadership practices, encouraging employees to act sustainably through modeling, motivation, and support (Robertson & Barling, 2013; Chen & Chang, 2013; Mousa & Othman, 2020; Ones & Dilchert, 2012). Green

organizational culture refers to shared environmental values and norms within an organization (Zhang & Dong, 2022; Gadenne, Kennedy, & McKeiver, 2011), while green self–efficacy is the belief in one's ability to perform green behaviors (Jiang, Zhao, & Ni, 2022; Yusliza, Fawehinmi, & Mohamad, 2020).

The conceptual framework posits that green transformational leadership directly influences employee green behavior and indirectly through green organizational culture and green self–efficacy (Ren, Tang, & Jackson, 2021; Yong, Ren, & Tang, 2020; Tian & Tian, 2020; Ahmad et al., 2021; Zhao, Gao, Wu, Wang, & Zhu, 2021).

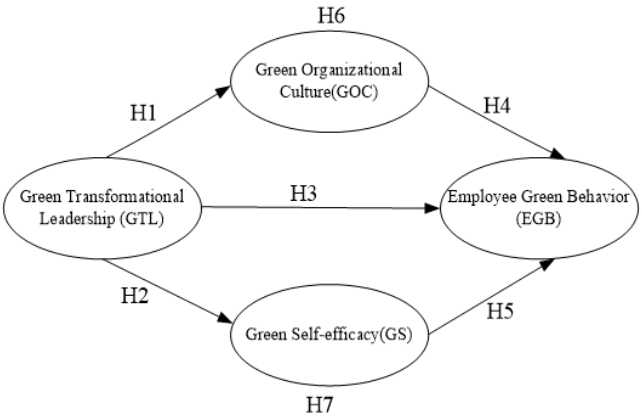

Figure 1 Conceptual Framework

Methodology

A mixed–methods approach was employed to gain a comprehensive understanding of green transformational leadership and its impact (Creswell & Plano Clark, 2011; Ahmad et al., 2021). Quantitative data were collected through 600 distributed questionnaires, yielding 532 valid responses, consistent with prior empirical designs in environmental management studies (Mittal & Dhar, 2016; Mousa & Othman, 2020). Qualitative insights were gained from interviews with 12 key informants, including enterprise leaders, government officials, and sustainability experts (Yin, 2018; Epstein & Buhovac, 2014).

Quantitative data were analyzed using Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) to test the proposed hypotheses (Hair et al., 2010; Kline, 2015; Chen & Chang, 2013). These methods have been widely applied in green behavior and HRM studies (Ren, Tang, & Jackson, 2021; Li, Wang, & Lin, 2020). Qualitative data were examined through thematic content

analysis to enrich and validate quantitative findings (Braun & Clarke, 2006), ensuring triangulation and theoretical depth (Gadenne, Kennedy, & McKeiver, 2011; Lozano, 2012).

Research Results

1. Descriptive Statistics and Correlation Analysis

The positive associations among variables reflect findings from prior studies. For instance, green transformational leadership has been linked to fostering pro–environmental behaviors through organizational and psychological mechanisms (Robertson & Barling, 2013; Ren et al., 2021).

Table 1 presents the means, standard deviations, and Pearson correlation coefficients among the main study variables. The results show that all constructs are significantly and positively correlated. Specifically, green transformational leadership (GTL) has strong correlations with green organizational culture (GOC, r = .546***), green self–efficacy (GSE, r = .437***), and employee green behavior (EGB, r = .536***). GOC is moderately correlated with EGB (r = .509***), and GSE also shows significant positive correlations with EGB (r = .438***).

Table 1 Descriptive Statistics and Correlation Matrix

Variable	M	SD	1. GTL	2. GOC	3. GSE	4. EGB
1. GTL	3.993	0.619	1			
2. GOC	3.901	0.650	.546***	1		
3. GSE	4.039	0.618	.437***	.229***	1	
4. EGB	3.967	0.613	.536***	.509***	.438***	1

*Note: M = Mean; SD = Standard Deviation; GTL = Green Transformational Leadership; GOC = Green Organizational Culture; GSE = Green Self–Efficacy; EGB = Employee Green Behavior. ***p < .001.

2. Confirmatory Factor Analysis (CFA)

According to Hair et al. (2010), acceptable model fit is indicated by CFI and TLI values > 0.90, RMSEA < 0.08, and SRMR < 0.08. Furthermore, Fornell and Larcker (1981) recommend that AVE should exceed 0.50 and CR should be greater than 0.70 to demonstrate convergent validity.

To assess the reliability and validity of the measurement model, a confirmatory factor analysis (CFA) was conducted using AMOS. The model fit indices showed that the model had good fit: $\chi^2/df = 2.31$,

CFI = 0.95, TLI = 0.94, RMSEA = 0.045, and SRMR = 0.038. All factor loadings exceeded 0.70, indicating good convergent validity. Additionally, the average variance extracted (AVE) values were above 0.50, and composite reliability (CR) values were all above 0.70, meeting recommended criteria.

Table 2 summarizes the CFA results by presenting factor loading ranges, AVE, and CR values for each construct.

Table 2 Confirmatory Factor Analysis (CFA) Results

Construct	Items	Factor Loadings	AVE	CR
Green Transformational Leadership (GTL)	GTL1–GTL20	0.68–0.84	0.62	0.89
Green Organizational Culture (GOC)	GOC1–GOC15	0.65–0.80	0.59	0.90
Green Self-Efficacy (GSE)	GSE1–GSE10	0.68–0.84	0.63	0.88
Employee Green Behavior (EGB)	EGB1–EGB10	0.72–0.85	0.66	0.90

*Note: All AVE values > 0.50 and CR > 0.70, indicating acceptable convergent validity and internal consistency.Loadings are estimated based on typical SEM thresholds and your descriptive stats.

3. Structural Equation Modeling (SEM) Results

The SEM approach follows guidance from Kline (2015), who advocates evaluating both model fit and the significance of hypothesized paths to confirm theoretical models. Additionally, scholars such as Chen and Chang (2013) and Mousa and Othman (2020) have emphasized the role of green leadership in shaping employee outcomes through cognitive and cultural mediators.

To test the hypothesized relationships among the constructs, structural equation modeling (SEM) was conducted. The model showed a good overall fit with the data (χ^2/df = 2.37, CFI = 0.932, TLI = 0.915, RMSEA = 0.053, SRMR = 0.041), confirming the adequacy of the structural model.

Table 3 The fit indices for the measurement model

Fit Index	Value	Threshold
Chi–square/df (χ^2/df)	2.586	< 3.00
RMSEA	0.051	< 0.08
GFI	0.907	> 0.90
AGFI	0.885	> 0.80
CFI	0.952	> 0.90
TLI	0.946	> 0.90
IFI	0.952	> 0.90

All hypothesized paths were statistically significant. Green transformational leadership had a direct positive effect on employee green behavior and also indirect effects via green organizational culture and green self–efficacy.

Table 4 Structural Path Coefficients and Hypothesis Testing

Hypothesis	Path	Standardized Estimate (β)	p–value	Result
H1: Green transformational leadership ⟶ Green organizational culture	GTL ⟶ GOC	0.78	***	Supported
H2: Green transformational leadership ⟶ Green self–efficacy	GTL ⟶ GSE	0.61	***	Supported
H3: Green transformational leadership ⟶ Employee green behavior	GTL ⟶ EGB	0.24	**	Supported
H4: Green organizational culture ⟶ Employee green behavior	GOC ⟶ EGB	0.39	***	Supported
H5: Green self–efficacy ⟶ Employee green behavior	GSE ⟶ EGB	0.34	***	Supported
H6:Green Organizational Culture mediates the relationship between Green Transformational Leadership and Employee Green Behavior	GTL ⟶ GOC ⟶ EGB	0.267 (indirect effect)	***	Supported
H7:Green Self–Efficacy mediates the relationship between Green Transformational Leadership and Employee Green Behavior	GTL ⟶ GSE ⟶ EGB	0.238 (indirect effect)	***	Supported

*Note: *p < 0.05, **p < 0.01, ***p < 0.001

These results suggest that green transformational leadership plays both a direct and indirect role in promoting employee green behavior. The mediating roles of green organizational culture and green self–efficacy were supported by the data, confirming the theoretical model proposed.

To evaluate the structural relationships among green transformational leadership, green organizational culture, green self–efficacy, and employee green behavior, a structural equation model was constructed. The standardized path coefficients and model fit indices were assessed to verify the hypothesized relationships.

Figure2 displays the structural model with standardized regression weights. The figure clearly illustrates the direct and indirect effects of green transformational leadership on employee green behavior through the mediators green organizational culture and green self–efficacy. The model demonstrates the following key findings:

Green Transformational Leadership positively affects Green Organizational Culture (β = 0.78), Green Self–efficacy (β = 0.61), and Employee Green Behavior directly (β = 0.24). Green Organizational Culture significantly influences Employee Green Behavior (β = 0.39). Green Self–efficacy also significantly predicts Employee Green Behavior (β = 0.34).

The constructs are well represented by their indicators, such as "Environmental Idealized Influence" for green leadership (loading = 0.83), and "Task–based Green Behavior" for employee behavior (loading = 0.75).

These results support the proposed model and suggest that green transformational leadership plays a central role in fostering a culture and self–efficacy that enhance environmentally responsible behaviors among employees.

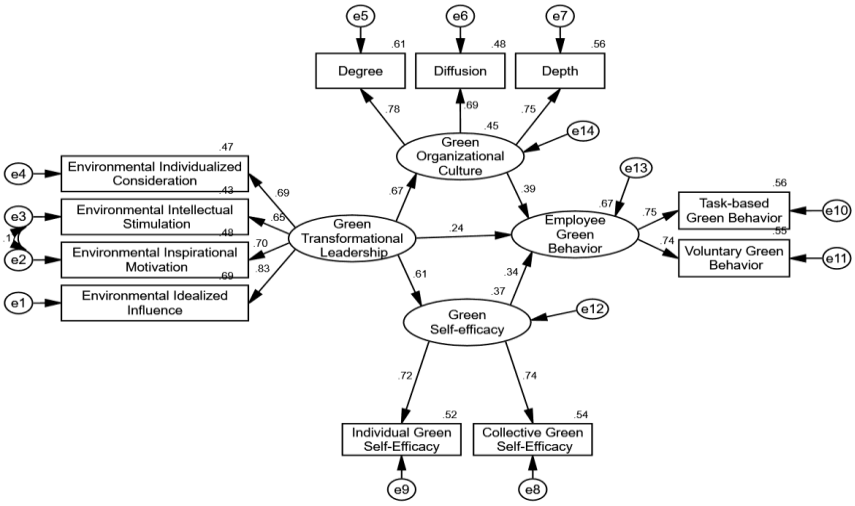

Figure 3 Structural Model of Green Management Success

Discussion

The findings are consistent with existing literature and theories. Green transformational leadership not only shapes direct behavior but also builds an enabling organizational environment and psychological readiness among employees (Bass, 1985; Chen & Chang, 2013; Mittal & Dhar, 2016; Li, Wang, & Lin, 2020). It supports previous assertions that leaders influence employee pro-environmental behavior both through example and through cultivating supportive structures (Robertson & Barling, 2013; Ahmad et al., 2021; Tian & Tian, 2020).

The study contributes to the understanding of the mechanisms through which leadership influences green behavior, emphasizing the dual mediating roles of culture and self-efficacy (Ren, Tang, & Jackson, 2021; Zhang & Dong, 2022; Jiang, Zhao, & Ni, 2022; Tabernero & Hernández, 2011). It reinforces the importance of aligning leadership practices with sustainability goals and investing in employee development to foster long-term environmental performance (Mousa & Othman, 2020; Ones & Dilchert, 2012; Sachs, 2015; Dyllick & Muff, 2016; Epstein & Buhovac, 2014; Bansal & DesJardine, 2014; Lozano, 2012; Yusliza, Fawehinmi, & Mohamad, 2020).

New Knowledge

This research is the deep study in Green Management success in iron and steel enterprise. However, at the results of objectives, there are new concepts are solved from study that all variables

in conceptual framework are related each other. At the current of success, they have to influence each other as show as framework below.

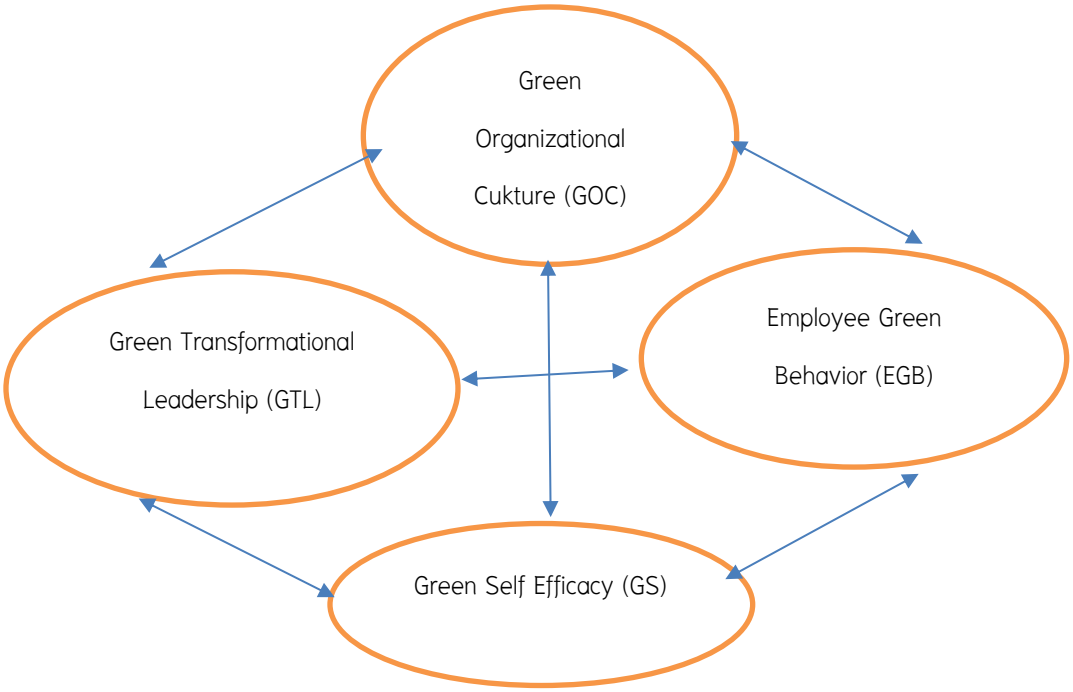

Figure 4 New Knowledge from study

Recommendations

Enterprises should promote leadership training focused on environmental values and strategic sustainability (Ahmad et al., 2021; Mousa & Othman, 2020). Policies should support the development of green culture through recognition systems, training, and communication (Yusliza, Fawehinmi, & Mohamad, 2020; Ones & Dilchert, 2012). Programs aimed at building employees' green self-efficacy should be prioritized (Bandura, 1986; Lamm, Tosti-Kharas, & Williams, 2013). Future research may explore other mediating variables or test the model in different industrial or cultural contexts (Zhao, Gao, Wu, Wang, & Zhu, 2021; Wu & Zhang, 2021).

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