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Moderating Role of Green Self Efficacy between Green Transformational Leadership and Green Creativity

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Abstract

This research examines the impact of green self-efficacy on the relationship between green transformational leadership and green innovation in the cement industry of Khyber Pakhtunkhwa, Pakistan. This study utilizes the Resource-Based View (RBV) and componential creativity theory to examine the relationship between green transformational leadership, staff creativity, and sustainable innovation. Quantitative data was collected from employees of three prominent cement businesses. The findings indicate that green transformational leadership positively influences green creativity, and that green self-efficacy significantly moderates this relationship. Employees with higher self-efficacy are more inclined to adopt innovative green practices, so reinforcing the impact of transformational leadership on environmental sustainability. The study enhances understanding of the impact of leadership on the implementation of environmentally sustainable initiatives and provides managers with valuable guidance on effectively embracing eco-friendly practices. The research highlights the need of establishing a leadership environment that is supportive and enhances employees' confidence in their abilities to contribute to sustainability goals.

Keywords: Green Transformational Leadership, Green Creativity, Green Self-Efficacy, Sustainable Innovation, Cement Industry, Environmental Sustainability, Resource-Based View.

Introduction

Recently, academics and businesses have become interested in sustainable green management concepts and practises as a strategy to lessen the negative effects of industrial waste and pollution (G. Li, Li, Choi, & Sethi, 2020). Organisations have been urged by stakeholders and scholars to create policies that will help them achieve their social, economic, and environmental objectives. Following is the notion of sustainability (Lopez-Cabrales & DeNisi 2021), whereas earlier green business models mainly concentrated on improving environmental process performance and asset utilisation, and can be defined as "an attempt to strike a balance between the economic, social, and environmental goals of companies," contextualising green leadership as a dimension of sustainability. Newer models, on the other hand, put more of an emphasis on growth planning, manufacturing techniques, and pre- and post-design consequences, which improves long-term viability (Begum, Xia, Ali, Awan, & Ashfaq, 2022).According to recent studies, greening SMEs can help companies reduce their carbon emissions, trash storage, and power usage (Awan,

Sroufe, & Kraslawski, 2019; Bai, Yuan, & Pan, 2017; Ojo, Raman, & Downe, 2019). As a result, research in academic and industrial domains is narrowing its focus from a general debate to one particular issue, namely the greening of specific functional departments and green financing (Przychodzen, Gómez-Bezares, & Przychodzen, 2018),such as green innovation and green creativity (Awan et al., 2019; Zailani, Govindan, Iranmanesh, Shaharudin, & Chong, 2015),and green human resource management and the practices (Yong, Yusliza, & Fawehinmi, 2020).Green creativity is the creation of unique and valuable green ideas on creating green products, processes, and practises, or delivery (Chen & Chang, 2013c; G. Li et al., 2020; Song, Yu, & Zhang, 2017).

The following empirical studies back up the claim that green leadership and other elements contribute to the growth of green creative behaviour (Mittal & Dhar, 2015; R. Singh, Behera, & Kumar, 2020; Tuan, 2019). The relationship between green transformational leadership and an environmentally integrated development practise and management system has been researched by a number of researchers R. Singh et al. (2020), despite the fact that it is an essential part of any firm to support green creativity (Li et al., 2020; Singh et al., 2020). The requirement for empirical proof of a connection between green transformational leadership and environmental performance still exists, though. The Resources-based View (RBV) hypothesis offers a conceptual framework for comprehending how firms may attain a lasting competitive advantage by managing resources that are valuable, scarce, difficult to imitate, and cannot be easily replaced (Das & Teng, 2000). RBV, when applied to environmental management, emphasizes the need of strong leadership in using these resources to tackle environmental concerns. GTL, via promoting a culture of environmentally friendly creativity and innovation, adheres to the principles of the Resource-Based View (RBV), allowing firms to cultivate distinctive characteristics that improve their sustainability performance (Amabile & Pillemer, 2012).

Our objective is to bridge the research gap. We have developed a comprehensive framework to examine the connections between three distinct concepts: green transformational leadership, green self-efficacy, and their outcomes. From an environmentalist standpoint, the need of green innovation for companies is paramount. We have created a research framework that incorporates two key factors, green transformational leadership and green self-efficacy, which may help firms enhance their green innovation efforts.

Problem Statement

Despite the growing need for organizations to adopt green practices, research has shown that green initiatives often fail to achieve their desired outcomes due to a lack of employee participation and creativity (Mittal & Dhar, 2016). While green transformational leadership has been identified as an effective approach to promoting green practices, there is limited research on the moderating role of green self-efficacy in the relationship between green transformational leadership and green creativity. Most existing studies focus on the direct effects of green transformational leadership without considering how individual psychological factors like self-efficacy might influence these outcomes (Qiu, Jie, Wang, & Zhao, 2020). This creates a research gap concerning how green self-efficacy might strengthen the link between leadership and green creativity. Addressing this gap is critical for understanding the dynamics of employee motivation and participation in green innovation. Therefore, this study aims to investigate the moderating role of green self-efficacy to identify effective strategies for promoting environmental sustainability and green leadership in organizations.

Research Questions

- Is there is any relationship among green transformational leadership, green creativity and green self-efficacy?
- How green transformational leadership effects green creativity?
- What will be the role of green self efficacy as a moderator in the relationship between green transformational leadership and green creativity?
- Does demographics of the respondents brings significant mean difference in research variables?

Research Objectives

- To investigate the relationship among green transformational leadership, green creativity and green self-efficacy.
- To identify the effect of green transformational leadership on green creativity.
- To elucidate the moderating role of green self-efficacy as a moderator in the relationship between green transformational leadership and green creativity.
- To elaborate the mean difference in research variables due to demographics of the respondents.

Literature Review

Green Transformational Leadership

Among the many leadership theories, transformational leadership recognizes the need for change and empowers and inspires followers to accomplish the stated objective (Avolio, Sosik, Jung, & Berson, 2003). Scholars have explored the idea of "green transformational leadership" in many contexts and have extended this concept to highlight the need of encouraging eco-friendly and ecologically sensitive actions (W. Li et al., 2020). Green transformational leadership is a type of leadership that aims to motivate employees to perform at an acceptable level in regard to the environment in order to meet an organization's environmental objectives (Chen & Chang, 2013). By assisting staff members in understanding the environmental purpose and vision, green transformational leaders play a critical role in encouraging sustainable behavior and establishing environmental standards (Chen & Chang, 2013). Green transformational leadership encourages employees to act in an environmentally responsible manner by exchanging green ideas, showing that they are confident in their environmental knowledge, and giving them chances to advance their environmental management skills (W. Li et al., 2020). The relationship between green creativity and green transformational leadership has also been verified by researchers, which raises the possibility that changing training initiatives might enhance an organization's environmental performance and encourage creative behavior from its workforce.

Green Creativity

Chen and Chang first introduced the notion of green creativity (Chen & Chang, 2013). They described creativity as the process of coming up with useful and original ideas for products that are eco-friendly. Although this term is frequently used in the field of green creativity research, it only refers to the product aspect. Nevertheless, it is difficult to establish whether the product can completely contain and encourage environmentally aware innovation. It is not appropriate for managers to assess a newcomer's level of green innovation based only on their inexperience with developing and researching green products. The term "green creativity" describes the process of coming up with creative and workable ideas for environmentally friendly goods, procedures, or services (Chen et al., 2015). Numerous organizational and individual components influence it. Chen and Chang (2013) found that encouraging green creative thinking requires both corporate leadership and a mindset toward ecological challenges. In another study, (Mittal & Dhar, 2016) suggested that green

transformational leadership encourages environmentally conscious creative behavior in staff members, which in turn reduces the consumption of paper and water and improves water recycling for sanitation needs, eventually helping to save the environment.

Green Self-Efficacy (GSE)

Self-efficacy pertains to the cognitive dimension of learning, particularly the belief in one's own capacity to do a certain task or pursue a particular career (Kornilaki, Thomas, & Font, 2019). It also clarifies the worker's understanding of their capacity to have a beneficial influence on the environment (Yang et al., 2023). In general, self-efficacy may influence employees' propensity to demonstrate desired behavior (Carter, Nesbit, Badham, Parker, & Sung, 2018) and successfully complete challenging activities (Al-Hamdan & Bani Issa, 2022). GSE, as used in a green context, refers to people's convictions and self-assurance that they can have a positive impact on sustainability and environmental quality. To put it simply, people's perception of their own capacity to successfully plan and carry out environmentally friendly projects in order to achieve environmental goals is known as Green Self-Efficacy (GSE) (Tsai, Chang, & Peng, 2016). Self-efficacy is the ability of a person to successfully carry out the activities necessary to meet certain performance goals. The ability of an organization to solve green environmental challenges and meet environmental objectives is the focus of green self-efficacy (Chen et al., 2015). Self-efficacy is the conviction that one can effectively organize and carry out the essential tasks to accomplish certain objectives. Green self-efficacy has been described in earlier research as a kind of self-awareness that supports long-term performance and pro environmental behavior. Green self-efficacy will rise, improving sustainable performance.

Green Transformational Leadership and Green Creativity

Aboramadan et al. (2022) asserts that improving environmental performance is significantly influenced by leaders. Furthermore, Halbesleben, Novicevic, Harvey, and Buckley (2003) found that leaders' traits have a significant impact on organizational creativity. According to Mittal and Dhar (2016), transformational leadership is essential to achieving creative results. According to Bass and Bass Bernard (1985), there are four characteristics of transformative leadership: charm, intellectual stimulation, personalized care, and inspirational motivation. According to Awan, Nauman, and Sroufe (2021) green innovation is essential to the advancement

of environmentally friendly and sustainable manufacturing. According to Mittal and Dhar (2016), the Global Cleantech (GCT) initiative is essential in encouraging the development of unique eco-friendly ideas that might propel green manufacturing and innovations. In an effort to protect the environment from pollution, two more studies showed a positive link between green transformational leadership and green creativity among employees in the technology industry. The study proposed the following hypothesis:

- H1: Green transformational leadership significantly effects green creativity.

Moderating Role of Green Self Efficacy

A more strategic approach is being adopted by markets and companies to include green HRM (Human Resource Management) policies and agendas into their primary goals. This is a result of people being more aware of the benefits and importance of sustainability, particularly in the hotel industry (Farooq, Zhang, Talwar, & Dhir, 2022). These firms recognize that HR has to broaden its purview and adjust to address upcoming environmental challenges since HR departments need leaders to effectively communicate GHRM policies and procedures to employees (Farooq et al., 2022). As previously said, GHRM is becoming more and more well-known. The hotel industry has realized that it has to adopt an effective leadership strategy because of a number of obstacles, such as changing customer preferences, the implementation of environmental regulations, and other important issues (Farooq et al., 2022). This is crucial because, as Green (2020) noted, leaders may inspire their teams to achieve and maintain organizational competitiveness by giving them chances and opportunities. Furthermore, employees' creativity is enhanced by leaders who adopt transformational behaviors, such as encouraging greater self-efficacy and providing greater autonomy (Mittal & Dhar, 2016). The important role that transformational leaders may play in modern organizations especially those that value environmental sustainability—has been recognized by both academic scholars and business executives. Green self-efficacy, an essential component of environmental attitudes and beliefs, raises managers' awareness of their responsibilities and motivates companies to use environmentally friendly methods like waste management. The study proposed following hypothesis:

- H2: Self efficacy significantly moderates the relationship between green transformational leadership significantly and green creativity.

Theoretical Insights

The Resource-Based View (RBV) theory provides the foundational framework for understanding how green transformational leadership (GTL) can influence green creativity, and how green self-efficacy moderates this relationship. RBV posits that organizations can achieve a competitive advantage by leveraging valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). In the context of this research, GTL is viewed as a crucial resource because it promotes environmentally responsible behavior, motivates employees, and fosters a culture of creativity aimed at achieving environmental sustainability goals. Additionally, green self-efficacy is another vital resource that strengthens employees' belief in their ability to successfully implement green practices. Employees with high levels of green self-efficacy are more likely to engage in innovative behaviors, which enhances the impact of GTL on green creativity (Chen & Chang, 2013).

GTL, as explained by RBV, creates an environment where employees are empowered to use their creative skills to address environmental challenges, thus fostering green creativity. Leaders who practice GTL utilize intellectual stimulation and inspirational motivation to encourage employees to generate creative green solutions that align with organizational sustainability goals (Mittal & Dhar, 2016). By promoting a shared green vision, GTL helps employees internalize environmental goals and motivates them to use their knowledge and skills to contribute to eco-friendly innovations (W. Li et al., 2020).

The role of green self-efficacy within this framework acts as a moderating factor, explaining why some employees respond more effectively to GTL than others. Social learning theory, which is embedded within RBV, suggests that employees who observe their leaders demonstrating confidence and environmental commitment are more likely to develop self-efficacy. Employees with higher green self-efficacy feel empowered to contribute to green innovation because they believe in their ability to succeed in eco-friendly tasks (Begum et al., 2022).

Theoretical Framework

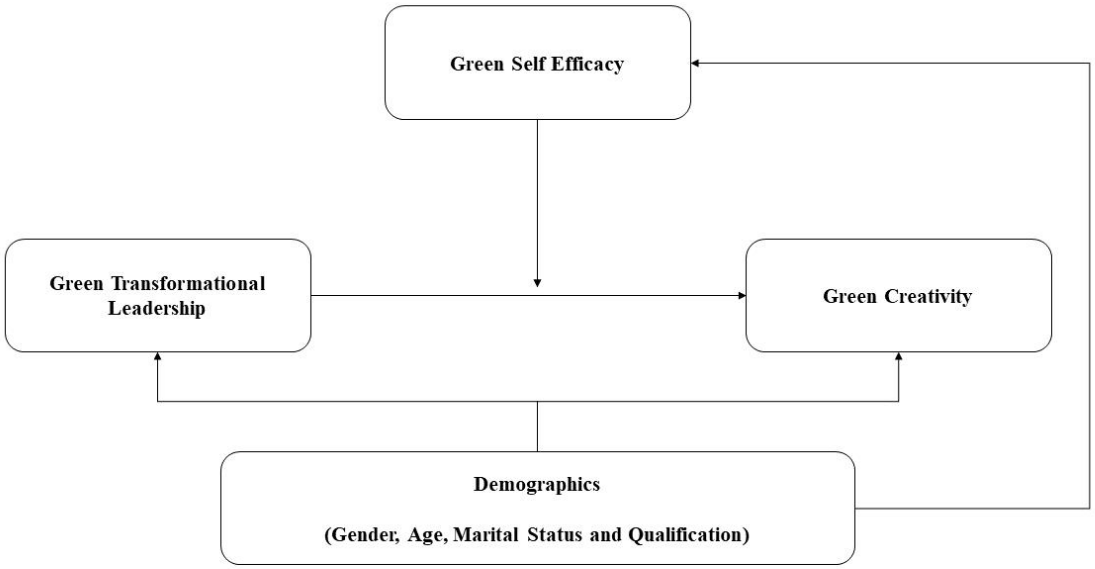


Figure 1: Theoretical Framework

Research Methodology

Research Process

The research process works with a few key components. The first is positivism the adopted research philosophy to analyze green transformational leadership and green creativity by employing empirical data and observable facts (M. Saunders, Lewis, & Thornhill, 2003). This takes an abductive approach, bringing together both inductive and deductive approaches to build a holistic understanding (Paavola, 2006). It is preferred a quantitative method, that provides the use of numeric data and statistical analyses for reliable conclusions (M. Saunders et al., 2003). The relevant survey strategy is selected for a systematic collection of data among the vast population. A short-term time frame guarantees a high level of topicality (Kosow & Gaßner, 2008).

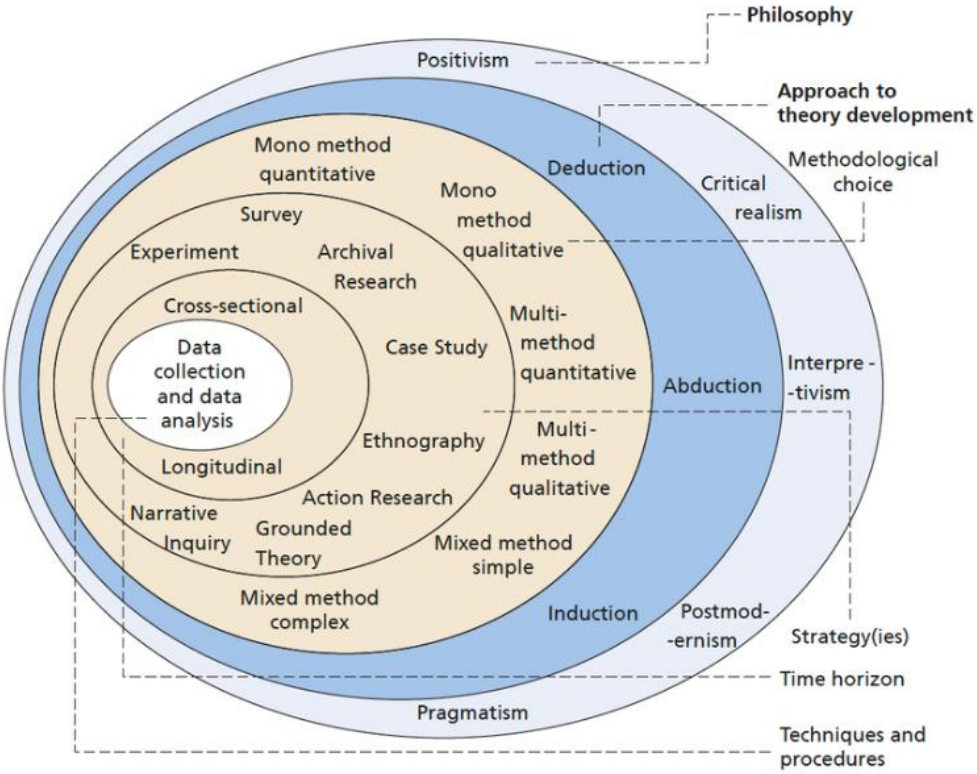


Figure 2: Research Onion

Methodological Choice

Methodological choice is essential to distinguish between types of quantitative and qualitative research. According to M. N. Saunders and Bezzina (2015), research can be helped through the use of mono methods, mixed methods, or multi-method techniques. The sample size was calculated using a quantitative research design on the moderating role of green self-efficacy between green transformational leadership and green creativity in cement factories of Khyber Pakhtunkhwa. It is to analyze relationships between variables by using numerical data and mathematical operations. Quantitative methods are particularly appropriate for this study because the application of quantitative methods can help in inferential testing and generalizable findings, which can lead to more credible and more objective findings regarding the effect of green transformational leadership on green creativity moderated by green self-efficacy (M. Saunders et al., 2003). These quantitative analysis methods, for example, the survey and the statistical procedures should be used systematically to analyze and provide results that show how the variables interact with each other in cement factories.

Population Under Study

The study's research population, which consists of the employees of three large

cement manufacturers operating in KP, was the source of the researcher's data. The whole workforce in these factories is made up of 8721 employees.

Sample Size and Sampling Techniques

The following Yamane (1965) formula was used by the researcher to determine the sample size:

S(n) = N/1+N*e2

Where

e = 5% (constant)

N = 8721

S(n) = 8721/1+8721(0.05)2

So, S(n) = 382.

Measurement of Variable

Questionnaire development is a critical aspect of this study, involving the use of well-established scales to measure the key variables: green transformational leadership, green creativity, and green self-efficacy. Each construct was evaluated using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), ensuring consistency and ease of response for participants.

- Green Transformational Leadership: This construct was measured by Chen and Chang (2013a) scale of six items. Items were created to embody important aspects of leadership behaviors encouraging and energizing employees toward environmental objectives. For example, items evaluate whether the leader can create a compelling green vision and encourage innovative methods to solve environmental problems.
- Green Creativity: The measurement of green creativity also utilized a six-item scale from Chen and Chang (2013a). This scale encapsulates the concept of green creativity within organizational settings. A representative item from this scale is: "This member of the organization suggests new ways to achieve environmental goals." Such items are aimed at gauging the innovative efforts of employees in proposing and implementing eco-friendly practices and solutions.
- Green Self-Efficacy: To measure green self-efficacy, the study employed a six-item scale developed by Chen, Chang, and Lin (2014). This scale assesses the confidence of individuals in their ability to perform tasks that contribute to environmental sustainability. The items are intended to reflect the respondents' self-

belief in their capability to engage in behaviors that support green initiatives.

Data Analysis

The data analysis strategy for this research, focusing on the moderating role of green self-efficacy in the relationship between green transformational leadership and green creativity in cement factories in Khyber Pakhtunkhwa, employs the Statistical Package for Social Sciences (SPSS) version 21. This software facilitates both descriptive and inferential statistical analyses.Initially, descriptive statistics summarized the basic features of the data, providing insights into the sample and measures. This involves assessing the reliability of the instruments using Cronbach's alpha to ensure consistency and evaluating data normality through skewness and kurtosis tests (Field, 2013).To test the hypotheses, Pearson's Product Moment Correlation used to examine the strength and direction of relationships between variables (Pallant, 2020). Simple Linear Regression determined the direct impact of green transformational leadership on green creativity. Multiple Hierarchical Regression analyses will then be conducted to explore the moderating role of green self-efficacy. The moderation effect assessed by including interaction terms in the regression models. Tests of significance, including the Independent Sample t-test and Analysis of Variance (ANOVA), compared group means and assess variability (Cohen, Cohen, West, & Aiken, 2013). This comprehensive approach ensures a robust understanding of the relationships within the data.

Results And Analysis

Descriptive Analysis (Instrument Reliability)

Table 4.1: Reliability Statistic

	Reliability Statistics	
Scale	**Cronbach's Alpha**	**N of Items**
Green Transformational Leadership	.763	6
Green Creativity	.786	6
Green Self Efficacy	.799	6

The reliability of the instrument used to measure Green Transformational Leadership, green creativity & green self efficacy was evaluated using Cronbach's Alpha statistic. The Cronbach's Alpha coefficient for green transformational leadership, green creativity & green self efficacy is determined to be 0.763, 0.786 & 0.799 respectively which suggests a satisfactory degree of internal consistency across the six items of

each variable included in the scale (Field, 2013).

Data Normality

Table 4.2 Data Normality Descriptive Statistics

Descriptive Statistics									
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	**Statistic**	**Statistic**	**Statistic**	**Statistic**	**Statistic**	**Std. Error**	**Statistic**	**Std. Error**
MeanGTL	388	1.33	5.00	3.8763	.61154	-1.202	.124	2.047	.247
MeanGC	388	1.50	5.00	3.9790	.63200	-1.214	.124	1.864	.247
MeanGSE	388	1.67	5.00	3.8501	.69477	-.900	.124	.549	.247
Valid N (listwise)	388								

Before moving towards hypothesis testing to reach certain results, it is crucial to test data normality, one of the important descriptive statistics. Table 4.2 reveals the normality of the data collected for analysis. Various tools are available to check data normality, but in quantitative, primary data research, skewness and kurtosis are widely used. For Green Transformational Leadership, the skewness value is -1.202 with a standard error of .124, and the kurtosis value is 2.047 with a standard error of .247. For Green Creativity (, the skewness value is -1.214 with a standard error of .124, and the kurtosis value is 1.864 with a standard error of .247. For Green Self-Efficacy, the skewness value is -.900 with a standard error of .124, and the kurtosis value is .549 with a standard error of .247. The above statistics confirm this normality assumption is met for the data of all three variables (Hair et al., 2007; Pallant, 2020).

Discriminant Validity

Table 4.3: Composite Reliability and AVE

Variables			λ2	1 - λ2	CR	AVE
Green Leadership	Transformational	.721	0.519492	0.480508	10.19959	0.393515
		.616	0.378964	0.621036		
		.678	0.459799	0.540201		
		.530	0.281177	0.718823		
		.573	0.328145	0.671855		
Green Creativity		.644	0.414916	0.585084	17.78209	0.481307
		.605	0.366191	0.633809		
		.766	0.586336	0.413664		
		.664	0.440474	0.559526		
		.702	0.492877	0.507123		
Green Self Efficacy		.766	0.587046	0.412954	15.41604	0.421331
		.704	0.495664	0.504336		
		.529	0.279866	0.720134		
		.585	0.342402	0.657598		
		.785	0.616689	0.383311		

.597	0.35690	0.64309
7	7	3
.661	0.43645	0.56354
1	5	5

Discriminant validity assesses the extent to which constructs in the study are distinct from each other. The results in the table show factor loadings (λ), squared loadings (λ^2), and CR (Composite Reliability) and AVE (Average Variance Extracted) for each variable. Green Transformational Leadership, Green Creativity, and Green Self-Efficacy exhibit acceptable factor loadings and AVE values, confirming the distinctiveness of each construct. The CR values are also adequate, indicating that the items reliably measure their intended constructs. Overall, the results support the discriminant validity of the constructs in the model.

Inferential Analysis

Correlation Analysis

Table 4.4: Correlation Analysis

Correlations

		MeanGTL	MeanGC	MeanGSE
MeanGTL	Pearson Correlation	1	.569**	.609**
	Sig. (2-tailed)		.000	.000
	N	388	388	388
MeanGC	Pearson Correlation	.569**	1	.733**
	Sig. (2-tailed)	.000		.000
	N	388	388	388
MeanGSE	Pearson Correlation	.609**	.733**	1
	Sig. (2-tailed)	.000	.000	
	N	388	388	388

**. *Correlation is significant at the 0.01 level (2-tailed).*

The correlation study shown in Table 4.4 demonstrates the associations between Green Transformational Leadership, Green Creativity, and Green Self-Efficacy. The relationship between Green Transformational Leadership and Green Creativity is very favorable ($r = .569$, $p < .01$), as is the relationship between Green Transformational Leadership and Green Self Efficacy ($r = .609$, $p < .01$). Green Creativity and Green Self Efficacy have a significant positive association ($r = .733$, $p < .01$). The observed

correlations indicate that there is a positive relationship between greater levels of Green Transformational Leadership and higher levels of Green Creativity and Green Self-Efficacy. Cohen (1988) states that a correlation coefficient of 0.50 is deemed significant, suggesting robust associations within this research. All correlations exhibit statistical significance at the 0.01 level, indicating the strong and reliable nature of these associations (Field, 2013). The robust link between Green Creativity and Green Self-Efficacy underscores the interdependence of both concepts in fostering an environmentally conscious and forward-thinking work atmosphere among staff members.

Simple Linear Regression

Table 4.5 Simple Linear Regression Model Summary

Model Summary [b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.569a	.323	.322	.52057

a. Predictors: (Constant), MeanGTL

b. Dependent Variable: MeanGC

The model summary indicates a robust positive association between Green Transformational Leadership and Green Creativity, as shown by an R-value of .569. The coefficient of determination (R Square) is 0.323, indicating that 32.3% of the variation in Green Creativity can be accounted for by Green Transformational Leadership. Cohen (1988) states that an R-square value of more than 0.26 is deemed significant, suggesting a robust ability of the model to explain the data. The Adjusted R Square value is 0.322, with a standard error of the estimate of 0.52057.

Table 4.6 Simple Linear Regression Coefficients

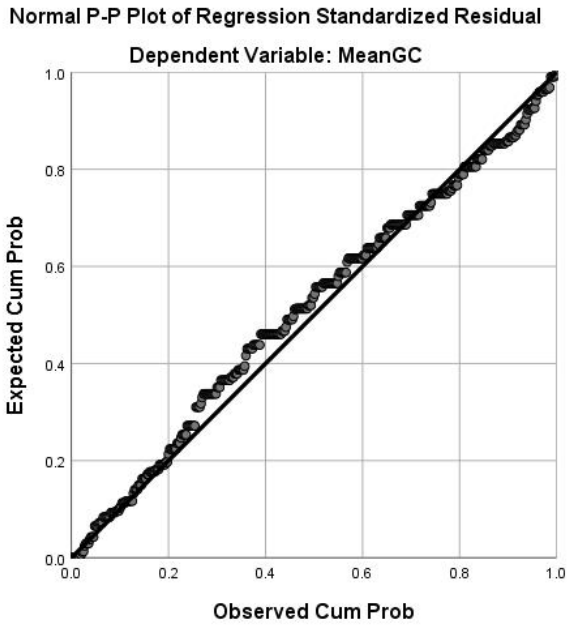
Coefficients [a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.701	.170		10.019	.000
	MeanGTL	.588	.043	.569	13.580	.000

a. Dependent Variable: MeanGC

The table displays the unstandardized coefficient (B) for Green Transformational Leadership as .588, accompanied by a standard error of .043. The standardized

coefficient (Beta) has a value of 0.569. The t-value is 13.580, and the p-value is .000, demonstrating a statistically significant link between Green Transformational Leadership and Green Creativity. The strong t-value and statistically significant p-value provide further evidence for the strength and reliability of this association (Cohen, 1988).

Figure 6 Normal P-P Plot of Regression



The Normal P-P Plot of regression normalized residuals for Green Creativity demonstrates that the data points closely adhere to the diagonal line, suggesting that the residuals have a normal distribution. This corroborates the assumption of normality in the regression analysis. The results of the basic linear regression analysis provide evidence that Green Transformational Leadership is a major predictor of Green Creativity. The study shows a high R-square value and significant coefficients, which support the existence of a strong association between these variables (Cohen, 1988; Field, 2013).

Multiple Hierarchical Regression (Moderation)

Table 4.7 Multiple Hierarchical Regression (Moderation)

Model: 1

Y: MeanGC

X: MeanGTL

W: MeanGSE

Model Summary

R	R-sq	MSE	F	df1	df2	p
.7517	.5651	.1751	166.3112	3.0000	384.0000	.0000

Model

Coeff	se	t	p	LLCI	ULCI
constant	.0271	.5795	.0467	.9628	-1.1124 1.1665
MeanGTL	.4856	.1629	2.9805	.0031	.1653 .8059
MeanGSE	.8540	.1664	5.1318	.0000	.5268 1.1811

R-square increase due to interaction(s):

Int_1	-.0802	.0441	-2.8182	.00698	.1670	.0065

A multiple hierarchical regression analysis was performed to investigate the moderating influence of Green Self-Efficacy on the association between Green Transformational Leadership and Green Creativity. The model summary has a high level of explanatory ability, as shown by an R-squared value of .5651. This means that 56.51% of the variation in Green Creativity can be accounted for by the predictors (Green Transformational Leadership, Green Self-Efficacy, and their interaction). The regression model has statistical significance, as shown by the F-statistic ($F(3, 384) = 166.3112$, $p < .0000$).

The regression analysis indicates that Green Transformational Leadership ($B = .4856$, $p = .0031$) and Green Self-Efficacy ($B = .8540$, $p < .0001$) are statistically significant predictors of Green Creativity. Furthermore, the interaction term (Green Transformational Leadership * Green Self-Efficacy) has a significant effect ($B = -.0802$, $p = .00698$), suggesting that Green Self-Efficacy influences the link between Green Transformational Leadership and Green Creativity. This indicates that the impact of Green Transformational Leadership on Green Creativity is strengthened when Green Self-Efficacy is strong, emphasizing the need to take into account moderating factors while studying the dynamics of Green Creativity (Cohen, 1988; Field, 2013).

Discussion

This study investigated the moderating effect of green self-efficacy on the relationship between green transformational leadership (GTL) and green creativity in the cement sector of Khyber Pakhtunkhwa. The results emphasize the significance of leadership and individual psychological factors in fostering sustainability and innovation within

organizations. Consistent with previous research, the findings confirm that GTL promotes green creativity by creating an environment conducive to innovative thinking for addressing environmental challenges (Mittal & Dhar, 2016; Li et al., 2020). Transformational leaders who prioritize environmental conservation inspire employees to engage in creative problem-solving that contributes to sustainable practices (Chen & Chang, 2013). The study strengthens the argument that transformational leadership behaviors not only motivate employees but also enable them to take a proactive role in finding creative, practical solutions for achieving environmental goals (Mittal & Dhar, 2016; Li et al., 2020).

Additionally, the study demonstrates a significant moderating effect of green self-efficacy on the relationship between GTL and green creativity. Employees with high levels of green self-efficacy are more likely to engage in creative environmental behaviors, thereby enhancing the effectiveness of transformational leadership. This aligns with Bandura's (1982) theory, which suggests that individuals with high self-efficacy persist in challenging tasks and are more confident in their ability to influence outcomes. In this context, green self-efficacy amplifies the positive impact of GTL by boosting employees' confidence in their capacity to engage in and promote environmental initiatives. This finding contributes to the literature by offering empirical support for the moderating role of self-efficacy, suggesting that it enhances the transformational leadership-creativity link by fostering a sense of empowerment and capability among employees (Kollmuss & Agyeman, 2002).

The study also contributes to the broader literature by integrating Resource-Based View (RBV) theory, which emphasizes the importance of unique organizational resources in achieving competitive advantage. Green self-efficacy can be viewed as a valuable, rare, and inimitable resource that strengthens an organization's capacity to innovate in sustainable ways. GTL, when combined with high green self-efficacy, helps firms develop distinctive competencies that enhance their environmental performance, thus supporting RBV theory's assertion that leveraging such intangible resources can lead to long-term success in sustainability initiatives. By emphasizing the importance of internal leadership and self-efficacy as strategic resources, this study enhances the theoretical understanding of how organizations can achieve competitive advantage through sustainability.

Conclusion

The research provides several theoretical and practical implications in terms of the

moderating effect of green self-efficacy on the relationship between green transformational leadership and green creativity in cement factories. This study, conducted in Khyber Pakhtunkhwa, offers significant insights into how green transformational leadership positively impacts green creativity, which is vital for organizations aiming to enhance their environmental sustainability practices. The influence of green transformational leadership is further moderated by the level of green self-efficacy among employees, highlighting the importance of individual belief in their ability to contribute to environmental initiatives.The empirical evidence collected from the cement industry in Khyber Pakhtunkhwa supports the hypothesis that green transformational leadership is likely to promote green creativity, especially when moderated by green self-efficacy. The quantitative methodology and sound data analytic techniques, including surveys and statistical tools, reinforce the reliability of these findings.Practically, this study highlights that organizations should create an environment where green self-efficacy is nurtured to make their employees feel more empowered to participate in green innovation. By embedding green transformational leadership practices, companies can drive creativity and green engineering efforts through their staff, thereby contributing towards wider environmental targets.This study offers several significant contributions to the conceptual and empirical literature on sustainable leadership and creativity, providing practical implications for promoting green behavior within organizations. Future research could explore the applicability of these findings across different industries and regions, offering insights into the extent to which this theoretical framework holds across various contexts.

Recommendations

Leadership development programs should be structured with the core objective of developing the essential qualities related to transformational leadership. These programs could train leaders to be inspiring role models who can motivate their teams to fulfill environmental sustainability missions. Emphasis should be placed on the role that strategic visioning, powerful communication, and inclusive space-making play in facilitating creative solution development for major ecological problems.It is important to bolster employees' confidence in their ability to contribute towards environmental sustainability. Organizations could develop training and development programs that help generate green self-efficacy. Examples include training units coaching in running workshops, mentoring sessions, and making guides available that enable staff to interact with green practices effortlessly. High self-efficacy will

generate more innovative behaviors and contribute to organizational sustainability goals.

Theoretical and Practical Implications

Individuals, leaders, and organizations can better comprehend the processes through which green transformational leadership impacts follower behavior by investigating how a complex set of constructs green self-efficacy and green creativity operate within impressionable employees in the cement industry. The findings offer several theoretical and practical implications.

Theoretical Implications

The contribution of this study to the field of sustainability and leadership is its integration of the Resource-Based View (RBV) and componential creativity theory. This implies the critical effect of individual organizational constructs and green self-efficacy, with the moderating role, mediating how green transformational leadership improves green creativity. This study builds on existing theories by highlighting the importance of self-efficacy in shaping transformational leadership outcomes.Thus, this study presents a contribution to RBV by showing how green transformational leadership can be seen as an innovative organizational resource, providing a competitive advantage and leading perspectives that are most favorable in sustainability. Further, the inclusion of componential creativity theory clarifies pathways to develop sustainable innovation in organizations through transformational leadership and self-efficacy, serving as detailed process mechanisms for a more complete metacognitive approach.

Practical Implications

The practical implications of this study encourage organizations to enhance sustainability practices through effective leadership and employee empowerment. A key strategy is to commit a portion of development time to intensive leadership training focused on developing transformational leadership skills. When leaders are equipped with tools that inspire innovation and motivate workers toward sustainability goals, this can lead to a company-wide cultural shift toward executing green projects. Such programs should include training, mentorship, and support for leaders to ensure effective change.Creating interventions designed to enhance green self-efficacy among employees will help expand the reach and impact of green transformational leadership. Targeted training programs can increase employees' confidence and skills in participating in sustainable solutions. By empowering

employees to contribute to environmental goals, organizations can foster a proactive workforce focused on generating innovative solutions to sustainability challenges.

Limitations and Future Directions

This study provides valuable insights into the role of green transformational leadership and green self-efficacy in fostering green creativity within the cement industry. However, several limitations need to be acknowledged, and directions for future research should be considered to build upon these findings.One of the primary limitations of this research is its focus on the cement industry within Khyber Pakhtunkhwa, which may limit the generalizability of the results to other industries or regions. The specific environmental challenges and organizational characteristics of the cement industry may not fully apply to different industrial sectors. Future research should seek to replicate this study in various industries and geographical areas to enhance its general applicability.Additionally, the study utilized a cross-sectional design, collecting data at a single point in time, which restricts the ability to establish causal relationships between the variables. Longitudinal research would be beneficial to examine how green transformational leadership and green creativity evolve and to establish clearer causal links.The reliance on self-reported data through surveys presents another limitation, as it may introduce biases such as social desirability bias. Participants might have reported what they perceive as socially acceptable behaviors rather than their true practices. Future research should consider incorporating objective measures or multi-source data to improve the reliability of findings.

Moreover, this study focused exclusively on green self-efficacy as a moderating factor. Future research should explore additional moderating or mediating variables, such as organizational culture, team dynamics, or external environmental pressures, to provide a more comprehensive understanding of the factors influencing green transformational leadership and green creativity.

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