PARADOXICAL LEADERSHIP, GREEN COMMITMENT, AND GREEN SELF-EFFICACY: THE MEDIATING AND MODERATING PATHWAYS TO GREEN INNOVATIVE WORK BEHAVIOR IN THE TOURISM AND HOSPITALITY BUSINESSES

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Abstract: This study investigates the impact of paradoxical leadership (PL) on green innovative work behavior (GIWB) among employees in Egypt's tourism and hospitality sector, with a particular focus on the mediating role of green commitment (GC) and the moderating role of green self-efficacy (GSE). Data were collected from 410 employees working in five-star hotels and category-A travel agencies in the Greater Cairo region of Egypt. The proposed conceptual framework was tested using PLS-SEM via WarpPLS statistical software. The results reveal that paradoxical leadership exerts a significant positive influence on GIWB. PL also demonstrates a strong direct effect on GC, which in turn positively influences GIWB, confirming GC's mediating role. Furthermore, GSE significantly moderates the relationship between PL and GC, suggesting that employees with higher levels of self-efficacy are more likely to translate leadership influences into green commitment. These findings enrich the growing literature on sustainable leadership by uncovering the psychological and motivational pathways through which paradoxical leadership fosters green innovation. The study highlights green commitment as a key mediating mechanism and green self-efficacy as a critical moderating condition that amplifies leadership effects. This integrated model provides a more nuanced understanding of how leadership behaviors translate into pro-environmental outcomes. In the tourism and hospitality sector, where sustainability and innovation are increasingly intertwined, paradoxical leadership proves especially relevant. Leaders who balance control with flexibility can inspire employees to act innovatively while remaining aligned with ecological values. The findings emphasize the need for organizations to develop such leadership capabilities.

Keywords: Paradoxical Leadership; Green Commitment; Green Self-Efficacy; Green Innovative Work Behavior; Tourism and Hospitality Businesses

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INTRODUCTION

In recent years, Egypt's Vision 2030 and the growing adoption of green tourism standards underscore the sector's shift toward sustainability. These national priorities have prompted hotels and travel enterprises to pursue eco-certifications, adopt environmentally responsible practices, and align more closely with global sustainable development goals. Amid escalating environmental concerns and stakeholder demands for sustainability, organizations across sectors are re-evaluating their leadership approaches to foster pro-environmental behaviors at work. In the tourism and hospitality sector—an industry both vulnerable to and responsible for environmental impacts—the need for innovative green solutions is particularly urgent. One emerging leadership style that shows promise in this context is paradoxical leadership.

Defined by its capacity to balance competing organizational demands—such as control versus autonomy, uniformity versus individualization, and short-term efficiency versus long-term sustainability—paradoxical leadership cultivates a work environment that supports creativity while maintaining alignment with strategic goals (Zhang et al., 2015; Chen & Yang, 2023). Such a leadership approach may be particularly conducive to promoting green innovative work behavior (GIWB), which refers to employees' voluntary efforts to generate, champion, and implement novel ideas that advance environmental sustainability (Chen & Chang, 2013; Batool et al., 2023). However, the emergence of GIWB does not solely depend on leadership influence; it is also shaped by employees' psychological orientations.

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One such orientation is green commitment—an individual's psychological attachment to environmental values—which can act as a conduit through which leadership translates into sustainable behavior (Paillé et al., 2014). Equally important is green self-efficacy, or employees' belief in their ability to perform green tasks, which may moderate how leadership and commitment interact to influence behavior (Zhou et al., 2021). While green commitment serves as a motivational bridge between leadership and behavior, green self-efficacy functions as a cognitive moderator that shapes the extent to which individuals can enact green behaviors. Although green leadership research is expanding (Al-Romeedy et al., 2025; Alshehri et al., 2024), few studies integrate psychological factors such as green commitment and self-efficacy within the paradoxical leadership framework, particularly within the tourism and hospitality domain.

Prior research has largely focused on more traditional leadership styles - such as transformational, ethical, or servant leadership - offering limited insights into how leaders navigate conflicting organizational and environmental goals. Paradoxical leadership, by contrast, offers a nuanced, dualistic approach that allows for structured innovation - potentially aligning well with the complex realities of driving green change in service-oriented contexts.

To address this gap, the present study develops and empirically tests a moderated mediation model that positions green commitment as a mediator in the relationship between paradoxical leadership and GIWB, and green self-efficacy as a moderator that conditions the strength of this relationship. This moderated mediation approach allows capturing both the underlying mechanism (green commitment) and the conditional boundary (green self-efficacy) through which paradoxical leadership affects GIWB, offering a nuanced understanding of green behavior at work. This framework recognizes that while paradoxical leadership may initiate change, the translation of leadership influence into action is contingent upon employees' motivational and psychological readiness. By focusing on five-star hotels and category - A travel agencies in Egypt—a context increasingly committed to sustainable development (Alqarni et al., 2023; Olya et al., 2024)—this study contributes theoretically by bridging paradoxical leadership and green psychology, and practically by offering strategies for sustainability in hospitality. Theoretically, it advances the literature by linking complex leadership behavior with individual psychological mechanisms that underpin green innovation.

Practically, it highlights the importance for organizations to not only adopt adaptive leadership styles but also to invest in building employee commitment and confidence to maximize the impact of green initiatives.

This study is grounded in two interrelated theoretical frameworks: Self-Efficacy Theory (Bandura, 1977) and Social Exchange Theory (Blau, 1964). From a self-efficacy perspective, employees are more likely to engage in green innovative work behavior (GIWB) when they possess a strong belief in their capability to contribute to environmental goals—termed green self-efficacy. Paradoxical leadership, by simultaneously offering structure and autonomy, fosters this belief. In parallel, Social Exchange Theory suggests that when employees perceive leaders as fair, inclusive, and supportive of sustainability, they are more likely to reciprocate through higher levels of green commitment.

Together, these frameworks explain how paradoxical leadership cultivates both the confidence (self-efficacy) and motivation (commitment) necessary for employees to engage in green innovation, particularly in the dynamic and resource-sensitive context of hospitality and tourism. In sum, this study responds to the call for more integrative models of green behavior at work by unpacking the intricate pathways through which paradoxical leadership can catalyze GIWB. In doing so, it offers valuable insights for advancing sustainability in hospitality organizations and beyond.

LITERATURE REVIEW
Paradoxical Leadership
Paradoxical leadership has gained prominence as a pivotal leadership approach in dynamic and complex organizational contexts. It encapsulates a leader's capacity to reconcile and integrate seemingly contradictory yet interdependent behaviors to effectively navigate competing demands (He & Yun, 2022; Zhang et al., 2015). Paradoxical leaders manage to balance control with autonomy, standardization with flexibility, and performance orientation with concern for employee well-being (Smith & Lewis, 2011; Miron-Spektor et al., 2018). These dualistic capabilities render paradoxical leadership especially relevant in environments that demand continuous learning and adaptation—such as the shift toward environmental sustainability (Yang et al., 2021; Shao et al., 2019). Emerging evidence suggests that such leadership fosters psychological safety and agility among employees, thus cultivating the conditions necessary for innovation and proactive green behaviors (Miron-Spektor et al., 2018; Waldman et al., 2019).

Green Commitment
Green commitment refers to employees' psychological attachment to and identification with their organization's environmental values and sustainability objectives. It embodies the internalization of ecological responsibility and reflects a willingness to align personal goals with organizational environmental missions (Paillé et al., 2016). Individuals with high green commitment are more inclined to support and actively engage in eco-initiatives, champion green policies, and embed sustainable practices into their daily work routines. This construct has also been shown to serve as a key mediating mechanism linking leadership behaviors to pro-environmental outcomes, indicating that leadership may shape eco-friendly behaviors indirectly through employees' motivational and attitudinal states (Robertson & Barling, 2017; Mousa & Othman, 2020).

Green Self-Efficacy
Green self-efficacy is defined as an individual's belief in their ability to effectively execute tasks that contribute to environmental sustainability. Grounded in Bandura's (1997) social cognitive theory, self-efficacy reflects an individual's confidence in initiating and sustaining specific actions. In the green context, employees with high green self-efficacy are

more likely to proactively address environmental challenges, implement sustainable solutions, and persist in the face of barriers (Zhou et al., 2021). Research indicates that green self-efficacy strengthens the translation of environmental intentions into meaningful behaviors and plays a crucial moderating role in leadership–behavioral relationships (Zhou et al., 2021), enhancing employees' readiness to engage in green innovation.

Green Innovative Work Behavior (GIWB)

Green innovative work behavior (GIWB) refers to employees' voluntary and discretionary efforts to generate, promote, and implement novel ideas, processes, or practices that contribute to the environmental sustainability of their organizations (Renwick et al., 2013). GIWB transcends routine compliance, encompassing creativity and initiative aimed at environmental improvement. It is increasingly recognized as a critical driver of green transformation and competitive differentiation in sustainability-oriented firms. Empirical evidence links GIWB to various antecedents, including leadership styles, organizational climate, psychological resources, and attitudinal variables (Deshpande et al., 2024). Moreover, GIWB contributes to broader organizational outcomes such as enhanced green performance, improved brand image, and long-term sustainability (Chaudhary, 2020; Liu et al., 2021).

Underpinning Theories. Self-Efficacy Theory

Self-Efficacy Theory, originally proposed by Bandura (1977), posits that individuals' belief in their ability to successfully execute specific tasks significantly influences their motivation, behavior, and performance. Self-efficacy determines how people think, feel, and respond to challenges, and those with high self-efficacy are more likely to set ambitious goals, invest sustained effort, and demonstrate resilience in the face of setbacks (Fida et al., 2025).

Bandura (1997) later elaborated that self-efficacy develops through four key mechanisms: mastery experiences, vicarious learning, social persuasion, and physiological and emotional states. These sources shape individuals' confidence in their capacity to act effectively, particularly when facing complex or novel challenges. In organizational contexts, higher self-efficacy enhances employee engagement, creativity, and performance under demanding conditions (Williams & Rhodes, 2014; Waddington, 2023). Within the framework of green innovative work behavior (GIWB), self-efficacy is particularly relevant. Employees with high green self-efficacy are more likely to proactively generate and implement environmentally sustainable ideas. They perceive eco-innovation not as a burden but as an achievable task aligned with their capabilities. Thus, self-efficacy theory underpins the moderating role of green self-efficacy in shaping how employees respond to leadership and translate green commitment into actionable behaviors.

Social Exchange Theory

Social Exchange Theory (SET), articulated by Blau (1964), explains social behavior as an outcome of reciprocal exchanges between individuals aimed at maximizing rewards and minimizing costs. In essence, the theory asserts that relationships are governed by the norms of reciprocity, perceived fairness, and mutual obligation (Cook & Hahn, 2021). When individuals receive favorable treatment—such as support, recognition, or fair leadership—they feel compelled to reciprocate through positive attitudes and behaviors. In organizational settings, SET has been widely used to explain how employees' perceptions of leadership behavior shape their commitment, motivation, and performance (Cropanzano et al., 2017). Leaders who demonstrate fairness, empowerment, and care for employee well-being foster high-quality exchange relationships. These relationships, in turn, lead to increased organizational commitment and discretionary behaviors, including innovation and environmental citizenship. Applied to this study, SET provides a valuable lens to understand how paradoxical leadership influences employees' green commitment. When employees perceive their leaders as balancing high expectations with support and autonomy—a hallmark of paradoxical leadership—they are likely to experience a sense of fairness and trust. This perceived reciprocity enhances their affective attachment to organizational environmental goals, motivating them to engage in green innovative behavior. In this way, SET offers a theoretical foundation for the mediating role of green commitment in the leadership–behavior link.

HYPOTHESES DEVELOPMENT
Paradoxical Leadership and Employees' Green Innovative Work Behavior

Paradoxical leadership encourages employees to reconcile competing demands such as stability versus change or control versus autonomy (Zhang et al., 2015). This leadership style fosters a work environment where contradictions are not perceived as problems but as opportunities for learning and innovation (Waldman & Bowen, 2016). In the context of sustainability, such leadership empowers employees to engage in green innovative work behavior (GIWB)—defined as the generation and application of new ideas, products, or processes aimed at improving environmental outcomes (Chen & Chang, 2013).

Paradoxical leadership integrates seemingly contradictory behaviors, such as high performance expectations coupled with employee empowerment, creating an environment of cognitive complexity and psychological safety—both essential for the development of green innovative behaviors (Zhang et al., 2015; Liu et al., 2020). These leaders create a climate where employees feel encouraged to explore novel, eco-friendly ideas while being aligned with organizational norms (Zhou et al., 2021). This dual focus on creativity and accountability enables employees to propose and implement innovative environmental solutions. Furthermore, paradoxical leaders tolerate ambiguity and foster adaptive thinking, crucial traits for navigating the uncertainties of environmental innovation (Zheng et al., 2023). By providing both structure and flexibility, these leaders enhance employees' psychological empowerment and proactivity—key drivers of GIWB (Zhang et al., 2015; Liu et al., 2020). Rather than enforcing a one-dimensional leadership style, paradoxical leadership embraces complexity,

thereby cultivating an organizational culture that promotes both innovation and environmental responsibility (Zhou et al., 2021). Based on the foregoing discussion, the following hypothesis is proposed:

H1: Paradoxical leadership positively impacts employees' green innovative work behavior.

Paradoxical Leadership and Employees' Green Commitment

Paradoxical leadership balances competing demands such as control and flexibility, which significantly shape employees' psychological orientation toward environmental sustainability (Qiang et al., 2023; Paillé et al., 2016). Leaders who exhibit this style—by establishing high performance standards while encouraging autonomy—are perceived as inclusive and values-driven (Zhang et al., 2015). When employees see their leaders as authentically supportive of sustainability, they are more likely to internalize environmental goals, leading to greater green commitment (Li et al., 2023). Green commitment reflects a strong affective attachment to environmental values and a willingness to support an organization's environmental objectives (Ma & Wang, 2024). Paradoxical leaders model environmental concern through their own behaviors, motivating employees to prioritize sustainability. These leaders also foster a motivational climate that enhances employees' engagement with green initiatives (Li et al., 2023).

The dual emphasis of paradoxical leadership on structure and autonomy enables employees to align personal values with organizational sustainability goals. These leaders also involve employees in green decision-making processes, thereby fostering trust, shared accountability, and deeper emotional investment in ecological objectives (Shao et al., 2019; Yang et al., 2021). Consequently, employees are more likely to experience a heightened sense of purpose and responsibility for environmental performance (Bhutto et al., 2021; Luu, 2021). Therefore, the following hypothesis is proposed:

H2: Paradoxical leadership positively impacts employees' green commitment.

Employees' Green Commitment and Green Innovative Work Behavior

Employees who are emotionally committed to environmental goals tend to engage more proactively in green innovation (Liu et al., 2021). Green commitment motivates individuals to propose and implement eco-friendly ideas at work, fostering a culture of innovation and sustainability. This behavior is both value-driven and performance-oriented, thereby enhancing organizational and environmental outcomes (Chen & Zhang, 2023).

Green commitment reflects the psychological attachment of employees to their organization's environmental objectives and serves as a motivational force for participating in sustainability-related initiatives (Khan et al., 2025; Hameed et al., 2020). Employees who strongly endorse green values are more inclined to take actions that develop and implement innovative green practices (Piwowar-Sulej et al., 2024; Deshpande et al., 2024). Furthermore, green commitment generates a sense of ownership and responsibility, encouraging employees to go beyond their formal duties (Yang et al., 2023). This includes suggesting eco-friendly practices, recommending sustainable solutions, and engaging in resource-conserving behaviors (Aboramadan et al., 2021). Based on this rationale, the following hypothesis is proposed:

H3: Employees' green commitment positively impacts employees' green innovative work behavior.

Green Commitment as a Mediator

The relationship between paradoxical leadership and green innovative work behavior may be mediated by employees' green commitment. Paradoxical leaders promote environmental values and demonstrate an integration of green and organizational priorities, which can enhance employees' internal motivation (Wang et al., 2024). This internal motivation manifests as green commitment, which translates leadership influence into concrete green innovation behaviors.

Green commitment captures employees' psychological dedication to environmental goals and drives behaviors that support and enhance environmental initiatives (Zaid & Yaqub, 2024; Zhang et al., 2023). Employees who internalize green values due to strong leadership support are more likely to contribute to the generation and implementation of eco-innovative practices (Li et al., 2023; Xu et al., 2023). Additionally, green commitment fosters a sense of responsibility, increasing proactive behaviors aimed at improving environmental performance (Jiang et al., 2024). Employees who feel committed to sustainability often go above and beyond their formal roles to suggest and develop innovative green solutions (Elshaer et al., 2024). Therefore, the following hypothesis is proposed:

H4: Employees' green commitment mediates the relationship between paradoxical leadership and employees' green innovative work behavior.

Green Self-Efficacy as a Moderator

Green self-efficacy refers to individuals' belief in their ability to perform environmentally responsible tasks (Xue et al., 2020). This belief system significantly influences how employees interpret and respond to paradoxical leadership behaviors (Bandura, 1997). Employees with high green self-efficacy are more likely to view the dual expectations of paradoxical leaders—control and empowerment—as challenges that promote personal growth rather than contradictions (Zhang et al., 2015; Liu et al., 2020). Green self-efficacy enhances the internalization of sustainability goals and increases emotional investment in organizational green initiatives (Jiang et al., 2024). It functions as a lens through which employees interpret mixed signals from leaders, facilitating a more constructive response to paradoxical leadership (Ren et al., 2025). Empirical studies across leadership contexts have shown that self-efficacy amplifies the positive effects of leadership on attitudinal outcomes, including commitment (Wang et al., 2023; Chen et al., 2024). Thus, green self-efficacy strengthens the effect of paradoxical leadership on green commitment by helping employees translate complex leadership behaviors into actionable values and goals (Ahmed & Khan, 2024; Saleem et al., 2024). Based on this logic, the following hypothesis is proposed:

H5: Employees' green self-efficacy moderates the relationship between paradoxical leadership and employees' green commitment. The theoretical framework of the study is illustrated below in Figure 1.
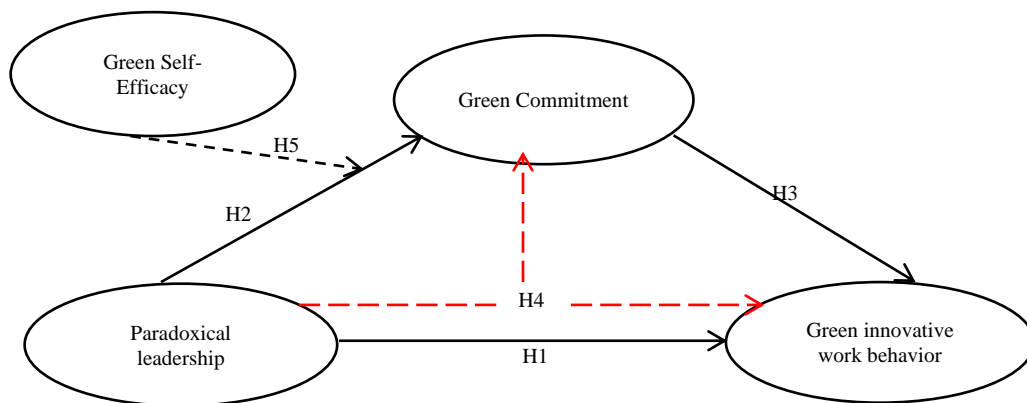

Figure 1. The theoretical framework of the study

RESEARCH METHODOLOGY

Measures

All measurement items used in this study were drawn from well-established and validated scales in the relevant literature. Paradoxical leadership was measured using a 4-item scale adapted from Zhang et al. (2015) and Hossain et al. (2024). Green innovative work behavior was assessed using six items adapted from the pioneering work of Scott & Bruce (1994), as well as more recent contributions by Khan et al. (2025). To measure employee green commitment, an 8-item scale proposed by Sugiarto & Huruta (2023) was employed. For green self-efficacy, a 6-item scale developed by Chen & Chang (2015) was utilized. Detailed survey items are provided in Appendix A. To ensure content validity, the questionnaire was pilot-tested with a sample of 20 individuals, comprising 5 academic experts, 5 business practitioners, and 10 employees. Feedback was used to enhance readability and relevance; however, no substantive changes were made to the original item content during this process. All items were measured using a 5-point Likert scale ranging from 1 = 'Strongly disagree' to 5 = 'Strongly agree.' This format was chosen for its clarity and alignment with prior research on psychological constructs in organizational and green behavior contexts

Sampling and Data Collection

This study focused on employees in five-star hotels and category-A travel agencies in Egypt, as these organizations have increasingly adopted green initiatives to promote sustainability (Alqarni et al., 2023; Olya et al., 2024). The decision to focus on the Greater Cairo Region of Egypt is both strategically and contextually appropriate. Greater Cairo stands as one of Egypt's premier international tourism hubs, characterized by a dense concentration of tourism and hotel establishments that operate within a highly competitive and environmentally sensitive ecosystem. These establishments face growing pressure to align with international sustainability standards while upholding service excellence. Such establishments frequently invest in leadership development, employee engagement initiatives, and environmentally responsible practices, making them particularly suitable for investigating the proposed research model, which explores the influence of paradoxical leadership on green innovative work behavior. Moreover, the structured HR systems and culturally diverse workforce within these properties provide a rich context for examining mediating and moderating mechanisms such as employee green commitment and green self-efficacy. The region's economic reliance on tourism and the importance of environmental preservation further underscore the relevance of studying sustainable employee behaviors in this context.

Data were collected through structured survey questionnaires, initially shared with the HR departments of the selected establishments. Upon receiving managerial approval, the questionnaires were distributed on-site to employees. Participation was voluntary, and confidentiality of responses was strictly maintained. According to the 2022 records of the Egyptian Ministry of Tourism and Antiquities, the Greater Cairo region hosts 1,666 category-A travel agencies and 30 five-star hotels. The data collection process was carried out during March and April 2025, targeting employees across 25 five-star hotels and 60 category-A travel agencies. A judgmental sampling technique was employed to select the participating organizations, while convenience sampling was used to recruit employees who were willing to participate. Surveys were administered following verbal managerial consent, and participants were informed that completing the survey constituted informed consent. Anonymity and ethical compliance were ensured throughout the process. A total of 410 valid responses were obtained—164 (40%) from travel agencies and 246 (60%) from five-star hotels—surpassing the minimum required sample size of 240 respondents, based on Hair et al.'s (2010) recommendation of a 1:10 ratio between estimated parameters and participants. This sample size was considered sufficient to support robust statistical analyses.

Data Analysis

To test the study's hypotheses and evaluate the proposed conceptual model, PLS-SEM was employed using WarpPLS software. PLS-SEM is particularly well-suited for research aiming to predict relationships among variables, especially when theory development is ongoing rather than theory testing alone. It offers a robust analytical approach for handling

complex models, accommodates smaller to medium sample sizes, and imposes fewer distributional assumptions compared to covariance-based SEM. The analysis assessed both the measurement model (outer model) and the structural model (inner model), consistent with the dual-step evaluation procedure recommended in the literature (Hair et al., 2019). This approach enabled the validation of constructs and the testing of direct, indirect (mediation), and interaction (moderation) effects, providing a comprehensive understanding of the relationships between paradoxical leadership, employee green commitment, green self-efficacy, and green innovative work behavior. To assess the model's overall adequacy, we evaluated fit indices provided by WarpPLS, including the Standardized Root Mean Square Residual (SRMR) and Tenenhaus Goodness-of-Fit (GoF). The SRMR value fell below the conventional threshold of 0.08, indicating a good model fit. The GoF value exceeded the 0.36 benchmark for large effect sizes, further supporting the model's explanatory power.

RESULTS
Participants' profile
Table 1 and Figure 2 provide an overview of the demographic characteristics of the study participants. The sample consisted of 410 employees, with a majority being male (67.8%), while females represented 32.2% of the respondents.

Table 1. Participant's profile (N=410)

		Frequency	Percent
Gender	Male	278	67.80
	Female	132	32.20
Age	< 30 years	108	26.34
	30- 45 years	200	48.78
	>45	102	24.88
Education	High schools	66	16.10
	Bachelor	310	75.61
	Master/PhD	34	8.29
To ensure valid and informed responses, the study included only participants with at least one year of work experience, consistent with Morrison's (1993) assertion that employees develop sufficient familiarity with organizational culture within the first six months.			

Regarding age, nearly half of the participants (48.78%) were between 30 and 45 years old, followed by those under 30 years (26.34%) and over 45 years (24.88%). In terms of education, most respondents held a bachelor's degree (75.61%), while 16.1% had completed high school, and 8.29% possessed a master's or PhD degree.
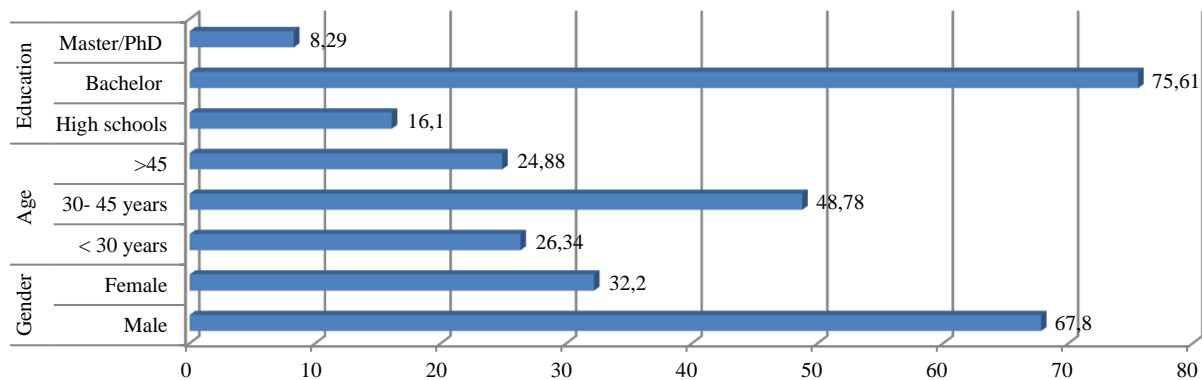

Figure 2. Participant's profile percentages

Non-Response Bias
To assess the potential for non-response bias, a statistical comparison was conducted between early and late respondents based on key demographic variables and central constructs of the study. This technique is widely recognized in survey-based research, as late respondents are often considered proxies for non-respondents (Armstrong & Overton, 1977). Independent samples t-tests revealed no statistically significant differences between the two groups across all measured dimensions ($p > 0.05$). These findings suggest that non-response bias is unlikely to pose a serious threat to the validity of the study results.

Common Method Bias
To evaluate the risk of common method bias (CMB), multiple diagnostic techniques were employed. First, Harman's single-factor test was conducted. The results indicated that multiple factors emerged, and the first factor accounted for less than 50% of the total variance, indicating that no single factor dominated the results. Recognizing the limitations of Harman's test when used in isolation, the study also applied a more robust diagnostic approach: the full collinearity assessment method proposed by Kock (2022). Variance Inflation Factor (VIF) values for all latent variables ranged from 1.998 to 3.038, with the average full collinearity VIF (AFVIF) calculated at 2.195. These values are well below the conservative threshold of 3.3, indicating that the model is not significantly affected by common method variance. This dual-method approach strengthens confidence in the integrity of the collected data and the robustness of the analysis.

Measurement model

Appendix (B) presents the model fit and quality indices for the structural model proposed by Kock's (2021). The results indicate that the model meets all the required thresholds, confirming its adequacy and robustness. The Average Path Coefficient (APC = 0.393, $p < 0.001$), Average R-squared (ARS = 0.499, $p < 0.001$), and Average Adjusted R-squared (AARS = 0.497, $p < 0.001$) all achieved statistical significance, supporting the model's explanatory power. Multicollinearity assessments, including the Average Block VIF (AVIF = 1.517) and Average Full Collinearity VIF (AFVIF = 2.195), were within acceptable thresholds (≤ 5), indicating no multicollinearity concerns.

Furthermore, global fit measures such as the Tenenhaus Goodness-of-Fit index (GoF = 0.602) exceeded the threshold for a large effect size (≥ 0.36). Additional indices, including the Sympson's Paradox Ratio (SPR = 1.000), R-squared Contribution Ratio (RSCR = 1.000), Statistical Suppression Ratio (SSR = 1.000), and Nonlinear Bivariate Causality Direction Ratio (NLBCDR = 1.000), all met or exceeded the ideal criteria, confirming the model's predictive relevance, stability, and lack of statistical anomalies.

Table 2 presents the results of the psychometric evaluation of the study constructs. All constructs demonstrated strong internal consistency, with Composite Reliability (CR) values ranging from 0.890 to 0.953 and Cronbach's Alpha (CA) values between 0.847 and 0.943, well above the recommended threshold of 0.70. The Average Variance Extracted (AVE) values for all constructs exceeded the 0.50 benchmark, confirming convergent validity.

Indicator loadings ranged from 0.642 to 0.911, suggesting satisfactory item reliability. Variance Inflation Factor (VIF) values were all below the critical value of 3.3, indicating the absence of multicollinearity concerns. Skewness and kurtosis values for all items fell within acceptable ranges, supporting the assumption of normality. Collectively, these results affirm the reliability, validity, and statistical adequacy of the measurement model used in this study.

Table 2. Results of psychometric properties

Construct	Indicators	Loading	CR	CA	AVE	VIF	Skew.	Kurt.
Paradoxical leadership (PL)	PL.1	(0.771)	0.897	0.847	0.686	2.100	-0.409	-0.943
	PL.2	(0.842)						
	PL.3	(0.873)						
	PL.4	(0.824)						
Green innovative work behavior (GIWB)	GIWB.1	(0.874)	0.917	0.891	0.650	1.998	-0.403	-1.139
	GIWB.2	(0.799)						
	GIWB.3	(0.833)						
	GIWB.4	(0.709)						
	GIWB.5	(0.831)						
	GIWB.6	(0.781)						
Green Commitment (EGC)	EGC.1	(0.911)	0.953	0.943	0.717	3.038	0.249	-1.270
	EGC.2	(0.877)						
	EGC.3	(0.767)						
	EGC.4	(0.840)						
	EGC.5	(0.803)						
	EGC.6	(0.783)						
	EGC.7	(0.896)						
	EGC.8	(0.882)						
Green Self-Efficacy (GSE)	GSE.1	(0.780)	0.890	0.851	0.576	2.495	-0.381	-0.613
	GSE.2	(0.820)						
	GSE.3	(0.768)						
	GSE.4	(0.810)						
	GSE.5	(0.718)						
	GSE.6	(0.642)						
"CR: Composite reliability; CA: Cronbach's alpha; AVE: average variance extracted; VIF: variance inflation factors ".								

Table 3 presents the correlations among the latent variables, with the square roots of the AVEs displayed on the diagonal. The diagonal values, ranging from 0.759 to 0.847, exceed the inter-construct correlations in their respective rows and columns, thus confirming discriminant validity based on the Fornell-Larcker criterion.

Table 3. Correlations among latent variables with the square root of AVEs

	PL	GC	GIWB	GSE
Paradoxical leadership (PL)	0.828			
Green Commitment (GC)	0.684	0.847		
Green innovative work behavior (GIWB)	0.478	0.596	0.806	
Green Self-Efficacy (GSE)	0.591	0.623	0.665	0.759

Table 4 reports the Heterotrait-Monotrait ratio of correlations (HTMT), which is a more stringent criterion for assessing discriminant validity among latent constructs. All HTMT values fall well below the conservative threshold of 0.85, with the highest being 0.770 between paradoxical leadership (PL) and green commitment (GC), and 0.768 between green innovative

work behavior (GIWB) and green self-efficacy (GSE). These results confirm that each construct is empirically distinct, providing further evidence of discriminant validity in the measurement model. The findings support the conceptual uniqueness of each variable and validate their inclusion as separate constructs within the proposed structural framework.

Table 4. Discriminant validity (HTMT)

	PL	GC	GIWB	GSE
Paradoxical leadership (PL)				
Green Commitment (GC)	0.770			
Green innovative work behavior (GIWB)	0.549	0.651		
Green Self-Efficacy (GSE)	0.693	0.694	0.768	

Multi-group analysis

A multi-group analysis was conducted to examine whether path coefficients differed significantly between employees working in hotels and those in travel agencies (Table 5). The results indicated no significant differences in any of the path coefficients between the two groups.

Table 5. Multigroup analysis

Hypotheses	β (Hotels)	β (Travel Agencies)	Absolute β. Diff.	p-values	T-statistic	Decesion
PL →GIWB	0.157	0.063	0.094	0.182	0.907	Not significant
PL →GC	0.627	0.644	0.017	0.429	0.178	Not significant
GC →GIWB	0.523	0.684	0.162	0.054	0.801	Not significant
PL*GSE → GIWB	0.227	0.281	0.054	0.297	0.532	Not significant

Structural model and hypothesis testing

Table 6 presents the results of the structural model, including both direct and moderating effects, and evaluates the strength of relationships using Cohen's (1988) effect size benchmarks. All hypothesized paths were statistically significant ($p < 0.01$), confirming empirical support. The direct effect of paradoxical leadership (PL) on green innovative work behavior (GIWB) was positive (β = 0.14) with a small effect size ($f^2 = 0.072$), as per Cohen's criteria (small ≥ 0.02, medium ≥ 0.15, large ≥ 0.35). PL had a strong direct effect on green commitment (GC) (β = 0.64) with a large effect size ($f^2 = 0.452$), while GC had a substantial effect on GIWB (β = 0.56) with a large effect size as well ($f^2 = 0.372$).

Table 6. Direct and moderation effects

H	Structural Paths	Path Coefficient ($β$)	P-values	Effect Size (f^2)	Result
	Direct Effect				
H1	PL →GIWB	0.14	<0.01	0.072	Supported
H2	PL →GC	0.64	<0.01	0.452	Supported
H3	GC →GIWB	0.56	<0.01	0.372	Supported
	Moderating Effect				
H5	PL*GSE → GIWB	0.23	<0.01	0.102	Supported
GC R^2 = 0.55, GIWB R^2 = 0.44					

The moderating effect of green self-efficacy (GSE) on the relationship between PL and GIWB was significant (β = 0.23) with a medium effect size ($f^2 = 0.102$), indicating that the influence of leadership on innovative behavior becomes more pronounced when employees have higher green self-efficacy. The model explains 55% of the variance in GC and 44% in GIWB, indicating a high level of explanatory power for the proposed framework.

Table 7. Mediation analysis

Hypo.		Path a	Path b	Indirect Effect	SE	t-value	Bootstrapped Confidence Interval		Mediation
							95% LL	95% UL	
H4	PL→GC→GIWB	0.640	0.560	0.358	0.033	10.861	0.294	0.423	Yes

Table 7 presents the results of the mediation analysis, which was conducted using the bootstrapping method recommended by Preacher and Hayes (2008)—a widely accepted statistical technique for evaluating the mediating role of variables in complex causal relationships. Specifically, the study tested Hypothesis H4, which posits that green commitment (GC) mediates the relationship between paradoxical leadership (PL) and green innovative work behavior (GIWB). The analysis reveals a significant indirect effect of 0.358, with a standard error of 0.033 and a t-value of 10.861, indicating a strong mediating relationship. The 95% bootstrapped confidence interval (CI) ranges from 0.294 to 0.423, which does not include zero, confirming the statistical significance of the mediation. Furthermore, both path a (PL → GC = 0.640) and path b (GC → GIWB = 0.560) are significant, reinforcing the robustness of the indirect pathway.

These findings demonstrate that paradoxical leadership significantly enhances green innovative behavior through its impact on employees' green commitment, thereby supporting the hypothesized mediation mechanism.

DISCUSSION

This study examined how paradoxical leadership influences green innovative work behavior among tourism and hotel employees, focusing on the mediating role of green commitment and the moderating effect of green self-efficacy. Findings confirmed that paradoxical leadership positively affects employees' green innovative work behavior (H1-supported), echoing prior research (i.e., Liu et al., 2020; Madaan et al., 2025; Devi, 2024). Paradoxical leaders foster creativity by embracing contradictory demands, such as combining flexibility with adherence to rules or emotional closeness with professional distance (Batool et al., 2023). This approach stimulates cognitive tension and psychological safety, empowering employees to take initiative (Yang et al., 2021) and hence propose environmentally innovative solutions. Moreover, the balance between autonomy and control, as well as the integration of short-term needs with long-term sustainability goals, creates a supportive context that encourages experimentation and alignment with the tourism and hotel industry's green objectives (Alsheref et al., 2024; Peng, 2024; Khairy et al., 2025a).

Paradoxical leadership also significantly enhances employee green commitment (H2-supported). In sustainability-driven tourism and hospitality contexts, this leadership style effectively manages inherent tensions by making green goals both aspirational and achievable (Smith et al., 2012; Batool et al., 2023). Through a dual focus on setting clear expectations and providing supportive engagement, paradoxical leaders cultivate a sense of shared responsibility (Dashuai & Bin, 2020; Waldman & Bowen, 2016; Batool et al., 2023). They reinforce intrinsic motivation by offering both structure and autonomy, fostering trust and aligning employee values with the organization's environmental vision (Fürstenberg et al., 2021; Zhang & Liu, 2022). Employee green commitment, in turn, was found to positively influence green innovative work behavior (H3-supported), echoing prior research (i.e., Chen & Zhang, 2023; Yang & Li, 2023). Committed employees demonstrate greater intrinsic motivation to contribute to sustainability, proactively identifying opportunities, championing green initiatives, and engaging in collaborative idea-sharing (Loor-Zambrano et al., 2022; Abdulrahman Al Abdulathi et al., 2024; Salama et al., 2024; Patwary et al., 2025). Their heightened environmental awareness and alignment with organizational goals translate into sustained and purposeful innovation efforts.

Furthermore, green commitment was shown to mediate the relationship between paradoxical leadership and green innovative work behavior (H4-supported). This suggests that paradoxical leadership fosters a work climate that promotes environmental values, which employees internalize and act upon. As a result, their commitment becomes the motivational bridge that links leadership behavior with innovative green practices. Finally, green self-efficacy moderated the relationship between paradoxical leadership and green commitment (H5-supported). Employees with high green self-efficacy are better equipped to interpret paradoxical leadership behaviors as empowering, enabling them to confidently engage with environmental initiatives (Jung et al., 2022; Xue et al., 2020). Conversely, those with low green self-efficacy may struggle with the ambiguity of paradoxical cues, reducing the likelihood that such leadership translates into meaningful commitment (Hornsey et al., 2015; Akhtar & Riaz, 2024). Thus, green self-efficacy acts as a psychological resource that strengthens or weakens the effect of paradoxical leadership on green commitment.

Theoretical Implications

This study makes significant contributions to the theoretical understanding of how leadership influences sustainability-oriented behavior in the tourism and hospitality sector. Most notably, it extends the application of Social Exchange Theory (Blau, 1964) by revealing that paradoxical leadership fosters green innovative work behavior through the mediating role of green commitment. Paradoxical leaders, by demonstrating both support and control, closeness and distance, encourage employees to perceive their leadership as a valuable social resource (Zhang et al., 2015; Devi, 2024). In turn, employees feel a sense of obligation to reciprocate through greater commitment to environmental values and by engaging in green innovation. This reciprocal relationship illustrates how employees go beyond their formal job roles when they perceive the organization, through its leadership, as investing in their personal and professional development, particularly within the environmental domain.

In addition, the study contributes to Self-Efficacy Theory (Bandura, 1977) by showing that the strength of the leadership–commitment relationship depends on an individual-level belief; green self-efficacy. Employees with high green self-efficacy interpret the flexible, empowering cues of paradoxical leaders as opportunities to act, rather than as sources of ambiguity or stress. This underscores the role of self-efficacy as a boundary condition that shapes how leadership is translated into motivation and behavior (Kim et al., 2022). By integrating self-efficacy as a moderator, the study enriches our understanding of how personal confidence in one's environmental capabilities enables or constrains the translation of leadership influence into green commitment and action.

Furthermore, this study bridges the gap between the leadership and sustainability literatures (Boeske, 2023; Liao, 2022; Sajjad et al., 2024; Khairy et al., 2025b) by empirically connecting paradoxical leadership with green innovative work behavior, a link rarely addressed in prior research. Unlike traditional leadership styles, paradoxical leadership accounts for the complexity and competing demands of sustainability in high-pressure settings like hotels (Madaan et al., 2025), where operational efficiency and guest satisfaction must coexist with long-term environmental responsibility. By uncovering the psychological mechanisms and contextual enablers of this process, the study provides a nuanced theoretical lens for understanding how leaders can cultivate sustainable innovation in dynamic organizational contexts.

Practical Implications

The findings offer clear guidance for tourism and hospitality practitioners seeking to promote green innovation at the employee level. First, tourism and hotel organizations should focus on developing paradoxical leadership (For example, a

hotel manager may enforce water-saving policies while encouraging staff to propose creative ways to enhance guest comfort without compromising sustainability) skills among their managers. This involves equipping leaders to balance structure with flexibility, short-term operational demands with long-term sustainability goals, and authority with empowerment. Leadership development programs should include training on how to manage these tensions constructively to foster an environment that supports creativity and innovation in green practices.

Second, organizations must nurture employee green commitment as a core driver of sustainability behavior (Noor Faezah et al., 2024; Suleman et al., 2024). This can be achieved by embedding environmental values into the organizational culture, communicating a compelling sustainability vision, and ensuring that green initiatives are visible, credible, and aligned with broader business objectives. When employees perceive green practices as meaningful and achievable, they are more likely to commit to them wholeheartedly and contribute proactively to innovation.

Third, the study highlights the importance of enhancing employees' green self-efficacy—their belief in their ability to contribute to environmental goals. Managers can support this through targeted training, participative decision-making, and by recognizing small wins in environmental performance. Creating opportunities for employees to engage in green projects and to learn from peer successes can build confidence and encourage a proactive mindset toward sustainability.

Fourth, organizations should align their human resource and sustainability strategies to reinforce green behaviors. Performance appraisals, incentives, and development plans should reflect and reward sustainability-oriented contributions. Designing jobs that incorporate green responsibilities and empowering employees to make eco-friendly decisions can sustain momentum and institutionalize green innovation.

Finally, practitioners should consider tailoring support to individual differences. Since the relationship between leadership and green commitment is stronger among those with higher green self-efficacy, organizations must identify and support employees who may lack confidence in this area. Providing mentorship, feedback, and structured opportunities to participate in green initiatives can help elevate these employees' sense of efficacy, thereby maximizing the impact of leadership across the workforce. To sum up, such initiatives not only enhance environmental performance but can also improve brand image, attract eco-conscious tourists, and reduce operational costs through energy-saving innovations.

Limitations and Future Research Directions

Despite its valuable contributions, this study is not without limitations, which open avenues for future research. First, the study employed a cross-sectional design, which restricts the ability to draw causal inferences between paradoxical leadership, green commitment, and green innovative work behavior. Future research could adopt longitudinal or experimental designs to establish temporal causality and better capture the dynamic nature of leadership influences on employee behavior over time. Second, the data were collected solely from five-star hotels and category-A travel agencies in Egypt, which may limit the generalizability of the findings across different organizational contexts, cultures, or sectors. Tourism and hospitality operations in other regions may have different environmental regulations, leadership norms, or employee attitudes toward sustainability. Future studies should replicate and extend this research in other industries or countries to test the robustness and cultural applicability of the findings. Third, while the study focused on green self-efficacy as a moderator, other individual or organizational-level variables, such as green transformational leadership, organizational climate for innovation, or team dynamics, might also influence the proposed relationships.

Future research could explore multilevel or moderated mediation models to examine these potential interactions more comprehensively. Finally, the study conceptualized green innovative work behavior as a unidimensional construct.

However, innovation can vary in terms of radical vs. incremental or process vs. product green innovation. Future work may benefit from disaggregating green innovation into finer categories to better understand which types of innovation are most influenced by paradoxical leadership and green commitment. By addressing these limitations, future research can build on the current study to provide a more nuanced and comprehensive understanding of how leadership dynamics foster sustainable innovation in the tourism and hospitality sector and beyond.

Appendix (A) measurement scales		
Paradoxical leadership Zhang et al. (2015) Hossain et al. (2024)	PL1	Leaders use a fair approach to treat all subordinates uniformly, but also treat them as individuals.
	PL2	A leader shows a desire to lead but allows others to share the leadership role.
	PL3	The leader controls important work issues but allows subordinates to handle details.
	PL4	Leader success conformity in task performance but allows for exceptions.
Green innovative work behavior Scott & Bruce (1994) Khan et al. (2025)	GIWB1	Search out new environmentally-related technologies, processes, techniques, and/or product ideas.
	GIWB2	I generate green creative ideas.
	GIWB3	I promote and champion green ideas with others.
	GIWB4	I investigate and secure the funds needed to implement new green ideas.
	GIWB5	I develop adequate plans and schedules for the implementation of new green ideas.
	GIWB6	I am environmentally innovative.
Employee Green Commitment Sugiarto & Huruta (2023)	EGC1	Support for company policies and commitment to a green workplace.
	EGC2	Commitment to perform green behavior in carrying out work.
	EGC3	Commitment to promoting green behavior to colleagues.
	EGC4	Commitment to assist colleagues in performing green behavior in the workplace.
	EGC5	Commitment to being responsible for performing green behavior in the workplace.
	EGC6	Commitment to being a role model in performing green behavior at work.

	EGC7	Commitment to making green behavior a habit and a work culture.
	EGC8	Commitment to participate in every green activity program conducted by the company.
Green Self-efficacy Chen & Chang (2015)	GSE1	I feel I can succeed in accomplishing environmental ideas.
	GSE2	I can achieve most of the environmental goals.
	GSE3	I feel competent to deal effectively with environmental tasks.
	GSE4	I can perform effectively on environmental missions.
	GSE5	I can overcome environmental problems.
	GSE6	I could find creative solutions to environmental problems.

Appendix (B): Model fit and quality indices			
	Assessment	Criterion	Decision
Average path coefficient (APC)	0.393, P<0.001	P<0.05	Supported
Average R-squared (ARS)	0.499, P<0.001	P<0.05	Supported
Average adjusted R-squared (AARS)	0.497, P<0.001	P<0.05	Supported
Average block VIF (AVIF)	1.517	acceptable if ≤ 5, ideally ≤ 3.3	Supported
Average full collinearity VIF (AFVIF)	2.195	acceptable if ≤ 5, ideally ≤ 3.3	Supported
Tenenhaus GoF (GoF)	0.602	small ≥ 0.1, medium ≥ 0.25, large ≥ 0.36	Supported
Sympson's paradox ratio (SPR)	1.000	acceptable if ≥ 0.7, ideally = 1	Supported
R-squared contribution ratio (RSCR)	1.000	acceptable if ≥ 0.9, ideally = 1	Supported
Statistical suppression ratio (SSR)	1.000	acceptable if ≥ 0.7	Supported
Nonlinear bivariate causality direction ratio (NLBCDR)	1.000	acceptable if ≥ 0.7	Supported

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