



## Driving Sustainable Change: Green Transformational Leadership, Job Crafting, and Work Engagement in Frugal Eco-Innovation



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<https://doi.org/10.18280/ijstdp.181220>

### ABSTRACT

**Received:** 25 May 2023

**Revised:** 14 September 2023

**Accepted:** 8 October 2023

**Available online:** 29 December 2023

#### Keywords:

*green transformational leadership, green work engagement, green job crafting, hospitality industry, frugal eco-innovation, bali, Indonesia*

Frugal Eco-Innovation (FEI) has become crucial for supporting the hospitality industry in third-world countries facing sustainability challenges. FEI can potentially enhance the environmental performance of employees in the hospitality sector. However, there is a lack of empirical studies on this topic in the existing literature. Therefore, our research aims to investigate the impact of Green Transformational Leadership (GTL), Green Work Engagement (GWE), and Green Job Crafting (GJC) on frugal eco-innovation. We conducted our study using a self-administered questionnaire, collecting data from 298 employees working in tourist hotels in Bali. We employed covariance-based structural equation modeling to test our hypotheses. Our statistical analysis revealed a significant positive relationship between green transformational leadership and overall frugal eco-innovation ( $b=0.215$ ,  $t=2.954$ ,  $p<0.003$ ). This result suggests that GTL significantly promotes frugal eco-innovation for sustainable practices among green hoteliers. Furthermore, our results indicated that GTL is equally important for both green job crafting and green work engagement. GTL practices were positively correlated with both variables ( $b=0.377$ ,  $t=5.289$ ,  $p<0.000$ ;  $b=0.542$ ,  $t=7.744$ ,  $p<0.000$ ). Lastly, we found that GTL has a significant indirect effect on FEI, mediated by GWE and GJC, with a partial mediation effect. This empirical investigation is the first that provides an organized way to examine the effects of green transformational leadership on frugal eco-innovation and recommends the most effective means for hoteliers to embrace the best policies for sustainable practice. This study has important policy implications for harnessing individual development into resource-constraint green management practice. Additionally, GTL provides a supportive environment for employees with green crafting and engagement to realize their green potential.

## 1. INTRODUCTION

Today, the hospitality industry is confronted with rising complexity and unpredictability on both local and global levels, such as fast technological innovation, changing client demands, resource-constrained environment, and pressure from competitors [1]. Hence, enhancing innovation capacities was highlighted as a strategic option for organizations to acquire a sustained competitive advantage. Innovation is a dynamic skill that increases customer or buyer value while lowering an industry's cost structure [2]. According to Hwang et al. [3], an organization's capacity for innovation will determine its success and competitiveness. Afsar et al. [4] argued that an organization's performance is substantially affected by how inventive it is or how much innovation it undertakes. Building organizational excellence through innovation to the organization's products and services is undeniable to meet customer needs.

Environmental sustainability has recently dramatically affected the company's innovation effort, especially in third-world countries. According to previous research, lack of resources and compliance restrictions are the most significant barriers to innovation in emerging economies worldwide [5]. As a result, they should reconsider their innovation initiatives as a critical source of competitive advantage. Frugal innovation is a way to innovate amid limitations, including the limited purchasing power of the market. The achievement of frugal innovation is the introduction of new products or services or modifying existing ones at market-competitive prices.

## 2. PROBLEM STATEMENT

Frugal innovation is frequently linked to sustainable practices because it supports environmental aims by saving

material and energy [6]. "Frugal eco-innovation is a novel, new or disruptive solution in the context of a resource-constrained environment". Additionally, frugal eco-innovations aim to provide customers with engaging value propositions by concentrating on the primary feature's functionality throughout the entire value chain, limiting the usage of material and financial resources.

Due to external influences that drive hotel corporations to be ecologically responsible, environmental challenges have become an inherent element of the hospitality sector. Businesses concerned about ecological issues can set themselves apart from similar but less environmentally conscious companies, allowing responsible enterprises to meet customers' demands for environmentally friendly products and services [7]. However, as a developing country, the hospitality industry in Indonesia faces challenges in meeting the demands regarding environmental conservation, which requires considerable costs due to the exploitation of natural resources [8]. Another study by Sharma and Thapar [9] in India found that tourism activities are increasing, leading to resource exploitation and production waste that is harmful to the environment, including disrupting tourism activities and reducing the interest of tourists to visit.

Frugal innovation in hospitality is viable for promoting sustainable environmental protection and social economics equity development. This innovation necessitates technology design, application, management, and marketing expertise while minimizing material and financial resources across the entire value chain. Given that developed countries rely on high-buying-power markets to practice traditional business, using sufficient resources, expensive product creation, and development. In that case, frugal innovation serves the most significant market with low purchasing power. Consequently, understanding key antecedents of frugal innovation is critical for enterprises in emerging countries. Bali, one of the world's most famous tourist destinations and named Pulau Dewata (Island of God), faces various environmental problems caused by tourism activities. Hotels in Bali have ecological issues that must be addressed innovatively. Limited resources have caused the hotel industry in Bali to improvise solutions most simply. Frugal innovation has evolved due to the need for Bali's hoteliers to reevaluate their approach to innovation in the face of limited resources.

Organizations need a blend of leaders capable of addressing complex issues with unique solutions to foster innovation and creativity. The transformational leader's role affects the company's ability to innovate consistently. According to Khan and Khan [10], transformational leaders primarily work as the driving force in promoting innovation capability because this leadership style creates a supportive and motivating environment. A transformative leader has a clear vision for their company, inspiring people and urging employees to take chances, making them suitable for use in firms that foster innovation [11].

The transformational leadership style also recognizes the required changes, creates a vision that will open the door for change, and puts the plans into action to foster an environment of creativity. Hence, we consider transformational leadership to have the highest potential to boost employee motivation to achieve organizational goals. Transformational leadership is critical in understanding proactive behavior by developing, empowering, and intellectually stimulating subordinates. TL inspires employees to reconsider their performance and challenge the status quo, motivating them to seek engaging

tasks. Transformational leadership has been found to influence the initiation of job crafting [12] substantially. This leadership style generates a supportive organizational climate and inspires followers to be creative and innovative.

Scholars argued that TL would activate higher levels of work engagement [13]. Transformational leaders create positive work-related behavior by inspiring and motivating their followers. As a result, high levels of work engagement are stimulated. In this case, a high level of engagement assists employees in improving their innovation ability. Engaged employees are excited about their work and serve as inspiration for others.

Many academics believe transformational leadership is the most effective strategy for increasing work engagement and job crafting. Therefore, this study provided an integrative research model of the effects of green transformational leadership on organizational frugal eco-innovation and studied the mediating role of green work engagement and employee green job crafting to advance the literature on the hospitality industry. In order to investigate the significance of all the variables above, this study used structural equation modeling (SEM) to analyze the degree of correlation among the constructs based on a survey of 298 participants from hotel employees in Bali. The subsequent sections of this study are organized in the following manner. Initially, a comprehensive examination of the existing body of scholarly works is conducted to elucidate the interconnections and associations among the various constructs within the proposed research model. Subsequently, the study approach employed to evaluate the proposed model is delineated. Following a thorough data analysis, the discussion focuses on the empirical findings. This paper concludes by presenting the discussions' theoretical and practical contributions.

### **3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

#### **3.1 Frugal eco-innovation**

Frugal Eco-Innovation (FEI) is gaining traction as a game-changing strategy in the fight for environmental sustainability. It is a potent method to help businesses save money while addressing environmental issues. Further, FEI combines the concepts of affordable innovation with a heavy focus on environmental responsibility, providing a promising route to long-term sustainability [14].

The focus of FEI extends beyond achieving higher productivity with limited resources; it encompasses the pursuit of sustainable practices. This approach spans a broad spectrum of practices, from designing products that optimize resource utilization to implementing environmentally friendly manufacturing methods and adopting sustainable business models. The objective is to reduce waste, decrease energy consumption, and mitigate environmental effects while maintaining high quality and performance standards.

The versatility of FEI means it can be used in a wide range of contexts. FEI provides a flexible set of tools that may be used by businesses across industries to lessen their negative effects on the environment. In agriculture, for instance, FEI could introduce new, inexpensive water and soil conservation methods that benefit the environment and local communities. FEI is not exclusive to developed economies; it thrives in developing countries and places with minimal resources. In

these situations, the lack of resources generally forces creative responses. FEI sees these limitations as challenges that can be overcome with ingenuity, and as a result, the solutions it develops are not only long-lasting but also relatively inexpensive and available to more people.

### **3.2 Green transformational leadership**

Emerging as a new paradigm, “green transformational leadership” combines the tenets of “transformational leadership” with “green values”. Leaders that adopt this stance are essential in today’s globe, where climate change and environmental degradation are significant challenges. Inspiration and motivation are at the heart of green transformational leadership, encouraging people and institutions to embrace more sustainable lifestyles [15]. These heads of state set the standard for others to follow by acting in inherently sustainable ways. As a result, they inspire their staff to work towards a greener future by establishing lofty sustainability targets.

The capacity to inspire and cultivate a committed following is a hallmark of green transformational leaders. Their employees have the knowledge and resources to make environmentally responsible decisions. Their ability to keep their companies at the forefront of sustainable practices directly results from the culture of continual learning and innovation they have fostered. Furthermore, these leaders emphasize the importance of ethical and responsible conduct, both in their behavior and in the operations of their businesses. The organization places a high value on transparency and accountability, ensuring its operations align with ecologically sustainable policies and legislation. Green transformational leaders prioritize the long-term ecological well-being of the earth rather than solely focusing on immediate benefits.

### **3.3 Green transformational leadership and frugal eco-innovation**

According to the path-goal theory (PGT), a fundamental purpose of leadership is to assist members in achieving their goals and provide direction and support to ensure they are consistent with the group’s goals or the organization’s whole [16]. This theory is based on the premise that a leader’s behavior strongly influences employees’ perceptions of the expectations between effort and performance. In line with the path-goal theory, characteristics of transformative leadership assist followers in seeing how the vision can be realized. This type of leadership will create a conducive climate for the subordinate to take the initiative and drive the company’s innovation capabilities.

The determinants directly related to innovation are vision, openness to experience, extraversion, empowerment, and employee appreciation. In addition, innovation is closely associated with decision-making quality and agility, two transformational leader competencies that affect innovation climate [17]. This empirical finding is confirmed by studies showing that transformational leadership affects creativity and organizational innovation [18].

Frugal innovation requires a leader who can empower all company resources to create and promote a creative and innovative ecosystem by utilizing limited resources to produce affordable goods or services and focusing on functional aspects at reasonable prices [19]. Hence, transformational leadership will encourage employees to encounter resource-

constrained status and develop innovative ideas to provide accessible services and products. GTL encourages corporate change and creativity by communicating a robust environmental vision, inspiring followers, and establishing trust. Consequently, subordinates are more likely to go the extra mile beyond their expectations to boost organizational effectiveness and performance for innovation. In this study, we used the idea of green transformational leadership, described as “leader behaviors that drive followers to engage in ecological activity and inspire employees to achieve higher levels of sustainable practices” [20]. Although previous research has looked into the critical role of leadership in constructing innovative work behavior, there is still a lack of literature on the relationship between green transformational leadership and employee frugal innovation in Indonesia’s hospitality sector.

As a result, we contended that GTL positively impacts an organization’s frugal eco-innovation. These considerations lead to the following hypothesis:

Hypothesis 1 (H1): Frugal eco-innovation positively correlates with transformational leadership.

### **3.4 Green transformational leadership and green work engagement**

Organizational leadership and work engagement are strongly related because leaders motivate workers and increase their job engagement by assisting their subordinates [21]. Transformational leadership is depicted as projecting and expressing appealing visions, common goals, and shared ideals that stimulate followers’ values, beliefs, and consciousness [22].

Transformational leadership inspires followers to focus on achieving more significant corporate goals and performance by providing a feeling of organizational vision and mission. Employees’ positive state of mind is nurtured by transformational leaders, which contributes to employee engagement. The research results of Çop et al. [15] show how transformational leadership encourages subordinates by providing intellectual stimulation and attending to their particular growth, generating energy, and maintaining enthusiasm even in a stressful work environment. We also argue that transformational leaders consistently inspire, facilitate followers’ abilities and motivate employees to reciprocate by investing their cognitive, emotional, and physical resources to boost work engagement. According to qualitative interviews with employees in the Netherlands [23], transformational leaders increase followers’ activity levels while generating good feedback, resulting in increased employee vigor, dedication, and absorption in work. Empirical evidence suggests that transformative leadership is connected favorably with employee engagement in the workplace [24]. It is hypothesized that an organization’s adoption of transformational leadership will increase green work engagement.

Hypothesis 2 (H2): Green transformational leadership is positively associated with high employee work engagement levels.

### **3.5 Green transformational leadership and green job crafting**

According to Bass and Riggio [25], transformational leadership prioritizes personal development and encourages

followers to take the initiative and think creatively. TL, in principle, motivates subordinates to be resourceful and have higher performance levels. Employees are more inclined to seek resources from transformational leaders since they are open and desire to share resources with them. TL can provide stimulus, attention, and motivation, providing personal support to employees, who will strengthen the psychological security of staff [26]. Henceforth, develop a positive psychological environment while at the same time encouraging proactive behavior as a manifestation of job crafting.

Employees are expected to be able to complete the demands of their work, such as high workload, work stress, and work fatigue, to compete and increase productivity at work. By allowing employees to choose their roles and responsibilities, transformational leaders may balance what they should do and how much they should do. Further, transformational leaders regularly engage in customized contacts with their supporters, promote communication, and respond to others adequately [27]. Hence, they are at ease discussing their demands-reducing needs because they feel safe. Employees may then leave some of their current jobs, take on other, more engaging ones, and align with their aspirations. As a result, we propose that followers are more likely to design their structural and social resources when the transformative leader pays attention to their followers (e.g., implement fresh and creative ideas, attempt to learn new things and enhance their capacities). As a result, transformational leadership encourages employees to start job-crafting behaviors. Accordingly, the current research suggests:

Hypotheses 3 (H3): Green transformational leadership and green job crafting have a favorable association.

### **3.6 Green work engagement and frugal eco-innovation**

According to Schaufeli et al. [28], work engagement is a positive motivational state characterized by dedication, vigor, and absorption. Vigor is a high level of resilience, persistence, and willingness to invest energy. Dedication is a strong commitment marked by enthusiasm, pride, and motivation. Absorption is a state of absolute immersion in which personnel experience rapid time passage and difficulty separating themselves from their work [29].

The broaden-and-build theory [30] posits that positive emotions (e.g., interest, enthusiasm, and pride) help broaden the range of a person's thought-action repertoire and encourage exploratory acts to develop personal throughout time, including psychological, physical, and intellectual resources. Following this logic, employees with higher levels of good emotions are more adaptable, innovative, creative, and efficient. Additionally, positive emotion improves cognitive flexibility, promotes more efficient problem-solving and decision-making, and more creative, innovative, and novel cognitive processing, allowing people to collect resources by broadening their experiences. Therefore, individuals are more likely to exceed expectations when experiencing positive emotions.

These studies posit that a positive emotional state influences the frugal innovation process when people are engaged at work. Moreover, personnel in the tourist and hospitality industries who are highly involved in their green-related responsibilities will exhibit greater frugal eco-innovation. In light of the above theoretical support and empirical evidence, we propose the following hypothesis:

Hypotheses 4 (H4): Green work engagement will positively predict frugal eco-innovation.

### **3.7 Green job crafting and frugal eco-innovation**

Innovation and creativity are essential for a company or business to survive and win the competition. However, in turbulent situations requiring high responsiveness, the top-down approach is often less effective in capturing change [31]. The top-down approach that demands adherence to performance indicators seems slow in responding to transformation. On the other hand, a bottom-up approach that places employees as a proactive source of innovation and creativity becomes relevant [32]. One embodiment of the bottom-up concept is job crafting, an employee's effort to change tasks, either physically, cognitively, or relational traits [33]. Work crafting is based on Bel and Staw [34] assertion that employees are not passive beneficiaries of organizational design but actively adapt employment to fit their preferences. Job crafting employees will feel comfortable and ultimately bound by the job.

An employee with a job crafting approach will modify job demands and resources according to preferences or personal aspects. Providing appropriate job resources can boost personal achievement, well-being, and dedication to focusing on innovation using present job resources. Job crafting entails individuals altering specific parts of their work, such as how they function, communicate with coworkers and conceive about their work. Hence, when viewed in a favorable light, these acts may assist an employee in performing better and enjoying their work more. The more employees participate in creating activities, the more confident they become in developing innovative new ideas or tasks. We engaged the discussion by arguing that favorable attitudes toward green job crafting encouraged employees to practice frugal eco-innovation in the hospitality industry, such as recycling waste, energy conservation, and efforts to reduce waste.

Hypotheses 5 (H5): Green job crafting positively influences frugal eco-innovation.

### **3.8 The mediating role of green work engagement and green job crafting**

Due to human behavior's complexity in personal and professional settings, we must consider the possibility of a more complex interplay among variables proposed via indirect effects. As a result, we recommend investigating the role of green work engagement and green job crafting in mediating the link between the transformational leader and frugal eco-innovation in the hospitality setting. Indeed, staff engagement levels may vary, and transformational leaders can promote employee engagement, improving employee frugal eco-innovation capacity. Transformational leaders can encourage followers to identify relationships through attractive behaviors, such as charismatic motivation and inspirational behavior [35]. Hence, this type of leadership can change followers' attitudes to dedicate and commit to their creative work activity.

Furthermore, transformational leaders can motivate people to reciprocate in enhanced work engagement by effectively investing their emotional, cognitive, and physical resources to manage the innovative organizational climate [23]. Consequently, work engagement can mediate transformational leadership and employee frugal eco-innovation capacity.

Various fields have shown that work engagement mediates innovative behavior [36].

Transformational leadership is also proven to raise the employee’s green job crafting level, which leads to innovative employee behavior [37]. Transformational leaders are those who stimulate positive affective reactions and convert their subordinates. They will inspire their followers to achieve extraordinary results by addressing personal growth requirements and leading them to rise above themselves for a common goal. Transformational leaders clearly express their mission and identify where adjustments are required. They drive their followers to strive for change by inspiring them to attain their goals, providing them with freedom, and creating a vision that inspires them to think outside the box.

We claimed that encouraging subordinates to be autonomous and creative by expanding structural and social resources will inspire people to craft their jobs. Additionally, employees may be more likely to increase their job resources and demand job demands, affecting their innovative work behavior in the long run. Bolstering this notion, several previous studies have demonstrated that job crafting mediates the association between transformational leadership and innovative behavior.

As explained above, the influence of transformational leadership can also make employees inclined to raise their job resources and challenge job demands, which may eventually affect their innovative, frugal behavior. The following hypothesis has been offered based on this viewpoint:

Hypotheses 5 (H6): The link between green transformational leadership and frugal eco-innovation is mediated by green work engagement. Hypotheses 6 (H7): The link between green transformational leadership and frugal eco-innovation is mediated by green job crafting. This study aims to enhance our understanding of the GTL-FEI link by exploring the role of GWE and GJC (Figure 1).

## 4. METHODS

### 4.1 Sample procedure for data collection

Employees of tourist hotels in Bali, Indonesia, provided data for this study, exploring the relationship between green transformational leadership, green work engagement, green job crafting, and frugal eco-innovation. The questionnaires were written in the English language. However, the questionnaires were translated into Bahasa Indonesia to collect data. To protect conversion quality, this translation was done with the support of two linguistic experts [38].

To gather information from hotel staff, we used a survey-based technique. Three research assistants solicited and recruited the employees who took part in the study. The respondents were given the cover letter, survey item, and reply envelopes, which they were asked to fill out and send to the human resource manager to maintain the respondent’s anonymity. Following the completion of data cleaning procedures, which encompassed the examination of survey responses (e.g., exclude participants who provide incomplete responses to the research inquiries, omit respondents who do not meet research objectives), missing values (e.g., deleting Rows with missing values, Imputing Averages) and the detection of outliers. Three respondent responses were discarded due to incomplete responses, and two responses were excluded due to outliers. The distribution of 358 questionnaires resulted in 298 responses. This condition indicates a response rate of 81.84 percent.

### 4.2 Measures

Before collecting the final data, all measures used in this study (Table 1) were pretested and changed to meet the pro-environmental context.

Green transformational leadership (GTL) was measured using [20] a five-item scale ranging from 1 (strongly disagree) to 5 (strongly agree). An example item is: (“The leader provides a clear environmental vision for the members to follow”).

Green Work Engagement (GWE) [39] provided six adopted items. An example item is: (“e.g., when I get up in the morning, I look forward to performing environment-related tasks at work”).

Green Job Crafting (GJC): Employees were asked to indicate the frequency with which they engaged in each conduct (1 never, 5 very often) in a five-item scale adapted from the study [40]. Green job crafting scale (“e.g., I organize my green activities in such a way as to make sure that I do not have to concentrate for too long a period at once”).

Frugal Eco-Innovation (FEI) used nine elements [41] to determine three characteristics of frugal eco-innovation. Three items assess frugal functionality (e.g., “We introduce new solutions that offer good and cheap green products/services”).

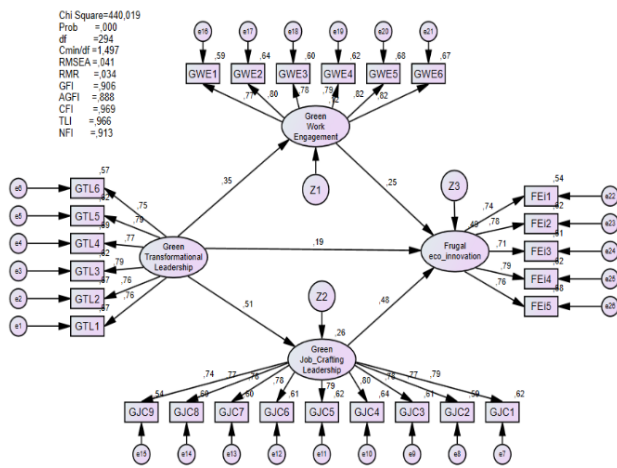


Figure 1. Empirical model result

Table 1. Results of measurement model

Items	Factor Loading	Composite Reliability	Average Variance Extract	$\alpha$
<i>Green Transformational Leadership</i>		<i>0.896</i>	<i>0.589</i>	<i>0.896</i>
GTL 1	0.757			
GTL 2	0.758			
GTL 3	0.784			
GTL 4	0.764			
GTL 5	0.787			
GTL 6	0.755			

<i>Green Work Engagement</i>		<i>0.912</i>	<i>0.635</i>	<i>0.912</i>
GWE 1	0.769			
GWE 2	0.802			
GWE 3	0.776			
GWE 4	0.788			
GWE 5	0.824			
GWE 6	0.820			
<i>Green Job Crafting</i>		<i>0.932</i>	<i>0.604</i>	<i>0.932</i>
GJI 1	0.786			
GJC 2	0.767			
GJC 3	0.782			
GJC 4	0.802			
GJC 5	0.789			
GJC 6	0.778			
GJC 7	0.778			
GJC 8	0.773			
GJC 9	0.737			
<i>Frugal Eco-innovation</i>		<i>0.870</i>	<i>0.572</i>	<i>0.869</i>
FEI 1	0.737			
FEI 2	0.782			
FEI 3	0.717			
FEI 4	0.783			
FEI 5	0.861			

## 5. RESULTS

### 5.1 Demographic characteristic

There were 298 respondents, 44.3% were male, and the remaining 55.7% were female. The group dominated the age of the respondents, with an age range of 26-30 years of 37.2%. Among the employees, 101 (33.40%) respondents were high school graduates; undergraduate is 40.67%, and Master's degree 25.50%. The respondents' 2.1-4 years tenure was 22.40%, 4.1-6 years 19.4 %, and more than 8.1 years was 12.70%. Respondents based on position, first-line level as much as 8.61%, supervisor 11.44%, assistant manager 4.00%, and manager level or more above 3.00%.

### 5.2 Common method bias

Podsakoff et al. [42] contended that self-reporting variables are affected by common method bias (CMB). Therefore, we employed statistical methods to detect and adjust for potential CMB in this investigation. Following the recommendation [43], the single-factor test [44] was applied in the CMB investigation. To analyze all questionnaire items for the four constructs with eigenvalues greater than one, both exploratory factor analysis and principal component factor analysis were utilized. The explanatory variance for the first item with the highest value is 34.28 percent, significantly lower than the suggested 50. The findings indicate that a wide variety of data sets are not significantly affected by a single component. As a result, CMB did not pose a risk to the research.

### 5.3 Procedures for data analysis

To gather information from hotel staff, we used a survey-based technique. Three research assistants solicited and recruited the employees who took part in the study. The respondents were given the cover letter, survey item, and reply envelopes, which they were asked to fill out and send to the human resource manager to maintain the respondent's anonymity. They were following the completion of data cleaning procedures, which encompassed the examination of survey responses (e.g., excluding participants who provide

incomplete responses to the research inquiries, omitting respondents who do not meet research objectives), missing values (e.g., deleting Rows with missing values, Imputing Averages) and the detection of outliers. Three respondent responses were discarded due to incomplete responses, and two responses were excluded due to outliers. The distribution of 358 questionnaires resulted in 298 responses. This condition indicates a response rate of 81.84 percent.

The data were collected at the individual level from hotel personnel and analyzed in two stages to examine the empirical model. Descriptive and inferential statistical techniques were used in the first phase. The tests mentioned above were obtained using the statistical program SPSS version 25. Further, the nature of our research is exploratory. Hence, we employed covariance-based structural equation modeling (CB-SEM) to assess model fit. We analyzed the data for missing values and outliers, and only two response responses are indicated as outliers and have been excluded from data processing. Following the recommendations for Covariance-based structural equation modeling (CB-SEM), we assessed measurement and structural models in two steps. First, the assessment started with a measuring model. The examination ensures construct reliability (construct reliability, indicator reliability, internal consistency) and validity (convergent and discriminant validity).

In the second step (structural model), this research investigated the probability of empirical relationship between the proposed constructs and how each function in the model. In addition, all of the suggested model's routes were tested in this step. Various fit indices were employed to assess the model's fitness ( $\chi^2$ , CFI, GFI, AGFI, TLI, and RMSEA). According to the suggestion of Preacher and Hayes (2000), we tested the mediating function of the green work engagement and green job crafting variables using the bootstrap mediation method approach by doing 5000 resampling with a 95% confidence interval.

### 5.4 Testing of hypotheses and result analysis

#### 5.4.1 Measurement model

We initially observed Cronbach's alpha coefficients to see

if the construct measurements were reliable. Table 2 demonstrates that Cronbach's alpha scores are above 0.70 [45]. The total measurement model was then evaluated using CFA to construct validity (Convergent and Discriminant). Statistical calculation confirmed an excellent level of convergent validity (ranging from 0.58 to 0.63). Further, the composite reliability (CR) ratings are all greater than the threshold of 0.70. (Ranging from 0.89 to 0.93); this result

provides solid internal consistency (see Table 2).

The fact that the square root of each construct's average variance extracted (AVE) was more significant than the correlations of the other constructs is evidence that this study supports the existence of discriminant validity (Table 3). As a result, the constructs' discriminant validity is confirmed. This statistical evidence confirms the construct's convergent and discriminant validity and reliability.

**Table 2.** Means, standard deviations, and correlations among the constructs

Variable	Mean	SD	1	2	3	4
Green Transformational Leadership	3.50	0.90	<b>0.767</b>			
Green Work Engagement	3.55	0.86	0.343	<b>0.796</b>		
Green Job Crafting	3.52	0.95	0.509	0.220	<b>0.777</b>	
Frugal Eco-Innovation	3.51	0.95	0.518	0.416	0.625	<b>0.756</b>

Notes: The square root of the AVE value is presented on the diagonal.

**Table 3.** Sample demographics characteristic

Category	Distribution	n	Frequency (%)
Gender	Male	132	44.3%
	Female	166	55.7%
Age	18-25	98	32.8%
	26-30	111	37.2%
	31-40	89	29.8%
Education Level	Senior High School or below	101	33.4%
	Undergraduate	121	40.6%
	Master's degree	76	25.5%
Tenure in Hospitality Industry	up to 2 years	56	18.7 %
	2.1-4 years	82	27.5%
	4.1-6 years	36	12.0%
	6.1-8 years	38	12.7%
	8.1-10 years	39	13.1%
	more than 10 years	47	15.7%
Job Experience	up to 2 years	72	18.1%
	2.1-4 years	67	22.4%
	4.1-6 years	58	19.4%
	6.1-8 years	42	14.1%
	8.1-10 years	38	12.7%
Job Position	more than 10 years	21	7.0%
	First-line level	243	81.5%
	Supervisor level	34	11.4%
	Assistant manager Level	12	4.0%
	Manager level or above	9	3.0%

**Table 4.** The result of hypotheses testing

	Path	Path Coefficient	SE	C.R
<b>Full Model</b>				
H1	Green Transformational Leadership on Frugal Innovation	0.215	0.073	2.954
	Green Transformational Leadership on Green Work Engagement	0.377	0.071	5.289**
H2	Green Transformational Leadership on Green Job Crafting	0.542	0.070	7.744**
	Green Transformational Leadership on Green Work			
H3	Engagement in Frugal Eco-Innovation	0.254	0.058	4.343**
	Green Job Crafting on Frugal Eco-Innovation	0.499	0.072	6.965**

Note: Significant at \*\*p < 0.001 level.

#### 5.4.2 Hypothesis testing

This research used a mixture of structural equation modeling and maximum likelihood estimation techniques to test the hypotheses. Hypothesis 1 stated that Green Transformational Leadership (GTL) positively correlates with frugal eco-innovation. Table 4 demonstrates hypothesis 1 and concludes that GTL has a significant and favorable relationship with FEI (b=0.215, t=2.954, p<0.003).

Furthermore, the hypothesis (H2) that GTL is causally linked to GWE was supported. In particular, the findings confirmed the GTL effect on GWE. (b=0.377, t=5.289, p<0.000). Our findings for Hypothesis 3 also revealed that GTL was linked to GJC in a significant manner (b=0.542, t=7.744, p<0.000). H4, which postulated a link between GWE and FEI, was also statistically significant (b=0.254, t=4.343, p<0.000). Following H5, there was a positive correlation between GJC and FEI (b=0.499, t=6.965, p<0.000).

Hypotheses 6 and 7, which proposed a mediating mechanism of green work engagement and green job crafting, showed a confidence interval. However, the statistical output indicates that the direct influence of transformational leadership on frugal eco-innovation decreased from (β=0.577, p<0.01) to H6=(β=0.476, p<0.001). Similarly, the direct influence of transformational leadership on frugal eco-innovation also declined from (β=0.577, p<0.001) to (β=0.301, p<0.01). Consequently, it was discovered that the connection between GTL and FEI is partially mediated by green work engagement and job crafting. Additionally, the 95 percent confidence interval (CI) of the indirect influence of transformational leadership on frugal eco-innovation via work engagement and green job crafting was tested using 5,000 bootstrapping resamplings, and the result concluded that there was an indirect effect of transformational leadership on green work engagement, 0.070 (CI: 95%; Boot LLCI=0.038; Boot ULCI=0.114) and green job crafting 0.185 (CI: 95%; Boot LLCI=0.142; Boot ULCI=0.259).

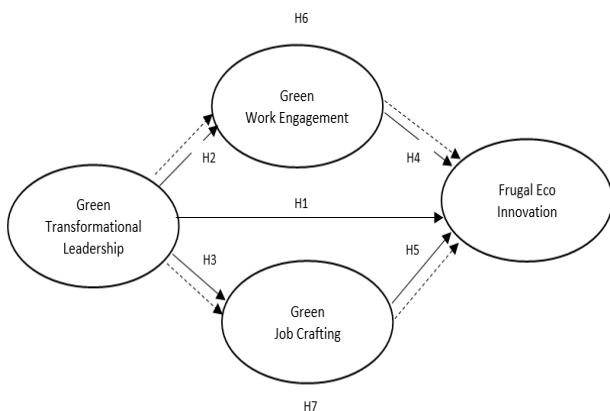
#### 5.5 Discussion

De Spiegelaere et al. [46] stated that innovation is the prerequisite for organizations to remain competitive. Given the short product life cycle and globalization, businesses cannot improve development without innovation. Frugal innovations have been presented as a possible way of servicing resource-constrained consumers in third-world markets and

Western economies experiencing poor growth. Hospitality firms can reduce their adverse environmental effects (water pollution, carbon emission, waste disposal) by employing frugal eco-innovation. With frugal innovation, the hospitality sector can also accomplish more with less, lowering their input consumption while keeping the same production level, resulting in significant cost savings.

This study investigates the relationship between transformational leadership and frugal eco-innovation as a possible method for attaining a sustained competitive advantage in the tourism sector. Furthermore, the study aimed to determine the role of employee green work engagement and green job crafting as mediating factors.

This study lends credence to the proposed structure provided in Figure 2. First, this study concluded that employee perceptions of their leader's green transformative qualities would improve their motivation to innovate in a resource-constrained environment (H1). Thus, according to the findings, GTL may drive workers to recommend, support, and advocate frugal green innovation to improve hotel environmental performance by keeping open to debating pro-environmental goals and novel green frugal ideas to achieve them. Additionally, GTL can motivate staff to develop innovative alternatives for more recent ecological problems and reevaluate and modify frugal green ideas by remaining available for consultation on environmental concerns to handle green issues at work. This result supports the study [19].



**Figure 2.** Conceptual framework

Moreover, this result is consistent with prior research [15] that looked into transformational leadership to boost green work engagement (H2). The hypothesis's support implies that leadership's transparency and responsiveness enhance employees' dedication, energy, and absorption in green frugal concerns. According to significant research on the impact of GTL on job crafting, our findings were also validated (H3). The results confirm the relationship between transformational leaders and followers' job crafting of hotel employees in Bali, Indonesia. GTL drives employees because it creates a great environment and displays concern and respect for them. Hence, motivated employees engage in proactive job behavior to attain their demand for expertise and advancement.

Following previous research conducted in the ecological and hospitality fields, Edelbroek et al. [47] stated that GWE and innovation have a beneficial relationship (H4). Prior research shows that individuals enthusiastically executing environmental-related duties at work will be more likely to promote, advocate, and support new green, frugal eco-

innovation and modify existing ecologically friendly activities. Additionally, workers who can rearrange their jobs regarding task structure, relationships, and knowledge will have a positive impact (H5). Employees can enhance frugal eco-innovation by proactively promoting opportunities to develop pro-environmental knowledge and skills. They can improve demanding job demands by actively participating in frugal eco-innovation projects and minimizing the number of emotional exchanges or cognitive tasks related to frugal eco-innovation initiatives.

Considering the theoretical underpinnings between GTL and frugal eco Innovation, the role of job crafting and work engagement as an intervening variable deserves more clarification. This study's findings show that GWE and GJC are vital in mediating the association between green transformational leadership and frugal eco-innovation. As a result, these findings imply that direct and indirect transformational leadership impacts followers' frugal eco-innovation through enhanced work engagement and job crafting. This result is in line with prior research on the impact of transformational leadership on frugal eco-innovation, work engagement, and employee job crafting.

## 5.6 Theoretical contribution

This research has produced certain conclusions that may be valuable for the theoretical basis. First, the paper provides a framework to describe how green transformational leadership influences green work engagement and job crafting, influencing frugal eco-innovation. The current research examines associations never investigated in the tourist and hospitality industry. Hence, our research advances knowledge in the field by shedding light on frugal eco-innovation in the tourist and hospitality industry.

Second, work engagement and job crafting are necessary to improve organizational innovation. However, whether these two variables (GWE and GJC) foster and substantially impact frugal innovation. The results show that GWE and GJC are essential for enhancing frugal eco-innovation.

Third, by creating and testing a serial mediation model, our study contributes to the literature by investigating the impact of GWE and GJC on the association between GTL and FEI. This research has validated the GWE and GJC mediation mechanism between transformational leadership and frugal innovation [19]. Considering GWE and GJC's successive mediating impact, we emphasize the motivational work elements in fostering employees' frugal eco-innovation. Prior studies have not explored and evaluated the sequential effects of these parameters on the connection between green transformational leadership and frugal eco-innovation in the tourism and hospitality industry. Finally, this research concludes that hospitality businesses can substantially contribute to environmental protection by adopting effective leadership styles in frugal eco-innovation activities.

## 5.7 Practical contribution

This study provides crucial suggestions for hoteliers in the hospitality industry. Our findings imply that organizations should consider transformational leadership to drive individuals to craft their green-related activities. For instance, green transformational leadership might provide individualized support to foster a trustworthy, open, and supportive environment where green job crafting is



encouraged. As a result, workers may feel confident and secure in crafting their job expectations and resources. Similarly, GTL may encourage people to discover meaning and identity in their work, allowing them to remain engaged. Hence, GTL may assist organizations and individuals in strengthening their work motivation.

We suggest a GTL provides a supportive environment for employees with green crafting and engagement to realize their green potential. Hence, it assists the company in incorporating green, frugal innovation into its operations and services to stay viable and competitive in the marketplace. Further, findings of the mediation effect imply that enhancing green job crafting and green work engagement is an effective strategy to increase green frugal innovation. As a result, employers may want to consider enhancing green job crafting and work engagement to help them construct frugal eco-innovation. Further, organizations should participate in frugal innovation and view it as a strategic resource for harnessing individual development into resource-constraint green management practice.

In conclusion, we advise hospitality leaders and managers in Bali to incorporate environmental managerial functions into the green performance evaluation and management system so that workers can regularly exhibit frugal work behaviors such as waste reduction, energy efficiency, and recycling. As a result, our research has a wide range of practical implications for all organizations and stakeholders interested in achieving and maintaining outstanding frugal innovation through green transformational leadership, green engagement, and green job crafting.

This study had certain shortcomings that should be addressed. The study focuses on tourist hotels in Bali, Indonesia. Future studies should expand to other regions and sectors, such as restaurants, entertainment, and other tourism-related services, to generalize and validate findings. Second, further research can also develop a comparative study between luxury and low-budget hotels by adopting this study's framework. Third, our study sampled organizational members' perceptions to measure green transformational leadership and frugal eco-innovation. We suggest that future research should sample internal and external stakeholders' perceptions to understand hotel GTL and frugal eco-innovation better.

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