International Journal of Hospitality Management 120 (2024) 103739

Contents lists available at ScienceDirect

International Journal of Hospitality Management

journal homepage: www.elsevier.com/locate/ijhm

Harnessing green innovation via green transformational leadership in Italian luxury hotels: Key strategic takeaways

Nadia Aslam Janjua [a], DA SHI [b,c], Umar Farooq Sahibzada [d,e,*]

[a] School of Tourism and Hotel Management, Dongbei University of Finance and Economics, China
[b] Surrey International Institute, Dongbei University of Finance and Economics, China
[c] DUFE-Surrey Joint Research Centre, China
[d] Business School for the Creative Industries, University for the Creative Arts, Epsom Campus, KT18 5BE, United Kingdom
[e] Department of Management, Information, and Production Engineering, Universita degli Studi di Bergamo, Bergamo, Italy

ARTICLE INFO

Keywords:
Green transformational leadership
Green dynamic capability
Green environmental orientation
Green innovation
Green performance
Competitive advantage

ABSTRACT

The increasing focus on environmental issues has resulted in the widespread acceptance and prominence of green innovation. However, existing literature on hotel management has overlooked exploring the key factors that drive green innovation specifically through the mediating mechanisms of green dynamic capability (GDC) and green environmental orientation (GEO). To fill the gap in the existing hospitality literature this study utilized the natural resource-based view (NRBV) to investigate the correlation between green transformational leadership (GTL) and green innovation (GI). Two research studies were carried out in Italian luxury hotels to assess the efficacy of the theoretical framework. The research findings emphasize that the enhancement of a hotel's GDC and GEO can be facilitated by providing GTL. This in turn may lead to the enhancement of GI which improves the CA and GP of a hotel.

1. Introduction

The detrimental effects of environmental pollutants have received substantial global attention, emphasizing the urgent need to tackle the diverse spectrum of sustainable development objectives outlined by the United Nations (Saqib et al., 2024). The hospitality industry has faced criticism in recent times for its substantial carbon emissions resulting from the extensive use of non-renewable resources (Choudhary and Datta, 2023; Hall et al., 2023). The growing environmental concerns have forced the hospitality and tourism industry to implement environmental management strategies to maintain their competitiveness in the global market (Awan et al., 2023; Muisyo et al., 2022). Scholars have tried to understand how organizations can sustain their competitiveness while upholding sustainability principles and environmental responsibility (Awan et al., 2023). Scholars have proposed that organizations ought to devise and execute ecologically sustainable innovations as a means of reducing their carbon footprint and mitigating potential environmental hazards (Appiah et al., 2023; Hall et al., 2023). Green innovation (GI) has been suggested as an essential condition for achieving sustainable growth and performance (Begum, Ashfaq, et al., 2022; Cui et al., 2023). Therefore, substantial research has been conducted to identify the factors that lead to environmentally friendly innovations (Begum, Ashfaq, et al., 2022; Lee et al., 2022). Research claims, however, that studies on environmentally friendly innovations are still in their infancy and lack substantial accomplishments (Appiah et al., 2023; Khanra et al., 2022), and a definitive conclusion has yet to be reached (Begum, Ashfaq, et al., 2022). Existing research indicates minimal consideration of how the hospitality industry brings about sustainable innovation (Arici et al., 2023; Mejia et al., 2022).

Effective leadership is essential for shaping the future direction of organizations in the rapidly changing today's business environment. Among the various leadership styles, transformational leadership has emerged as a compelling and influential approach that surpasses conventional notions of management (Singh and Chaudhary, 2023). GTL denotes offering motivation and inspiration to fulfil the environmental objectives of the organization (Chen and Chang, 2013). A green transformational leader motivates their subordinates to engage in activities that promote the organization's environmental management (Priyadarshini et al., 2023). This includes encouraging sustainable development, finding solutions to environmental issues and contributing to the firm's overall environmental performance (Priyadarshini et al., 2023). The critical role of green transformational leadership (GTL) concerning

* Corresponding author: Business School for the Creative Industries, University for the Creative Arts, Epsom Campus, KT18 5BE, United Kingdom.
E-mail address: umar_sahibzada@hotmail.com (U.F. Sahibzada).

https://doi.org/10.1016/j.ijhm.2024.103739
Received 4 August 2023; Received in revised form 12 January 2024; Accepted 19 March 2024
Available online 27 March 2024

GI has been acknowledged in various industries (Begum, Ashfaq, et al., 2022; Niazi et al., 2023; Shehzad et al., 2024; Zhang et al., 2023). Numerous studies suggest that GTL has a significant influence in mitigating the detrimental environmental consequences arising from industrial pollution (Awan et al., 2023; Begum, Ashfaq, et al., 2022; Cui et al., 2023). However, how GTL's benefits to businesses are materialized is still largely unknown (Singh et al., 2020) particularly in the hospitality industry (Farooq et al., 2022). Therefore, further investigation has been suggested to fully comprehend the association between GTL and GI (Begum, Ashfaq, et al., 2022). The hospitality and tourism industry context is no exception (Gürlek and Koseoglu, 2021).

Additionally, it is argued that the influence of GTL on GI within the hospitality industry is complex and constantly evolving due to various intervening factors that may either enhance or diminish the relationship. Therefore, our study employs the natural resource-based view (NRBV) theory proposed by (Hart, 1995) to understand the connection between GTL and GI. The NRBV framework establishes a connection between organizational resources and capabilities and the natural environment (Begum, Ashfaq, et al., 2022). Our study contends that these resources and capabilities encompass the green dynamic capabilities (GDC) and green environmental orientation (GEO) of a hotel. Scholars assert that GI as an outcome is contingent on organizational dynamic capability (Yuan and Cao, 2022) and environmental orientation (Zameer et al., 2022). Due to the growing awareness of environmental issues among the community, there is a claim that the hospitality industry is facing increasing pressure to improve its public image and financial performance by adopting Green Initiatives (GI) (Gu, 2022). Existing research indicates minimal consideration of how luxury hotels bring about sustainable innovation (Gu, 2022). The significance of empirical evidence and theoretical interpretation in related concepts is currently restricted with no established context specifically pertaining to the Italian hospitality industry. Therefore, it is imperative to examine factors that promote GI due to their ramifications for the hospitality sector in an ever-expanding globalized marketplace. Based on the gap and ambiguity in the prevailing academic works, we therefore presented a theoretical model that illustrates how hotels harness organizational green dynamic capability (GDC) and green environmental orientation (GEO) to expedite green innovations for achieving competitive advantage and green performance. Thus, we recommend that GTL as a strong organizational resource may enhance GDC and GEO of organizations to obtain GI. Prior research has investigated the intermediary role of GDC in the connections between CSR-GI associations within the manufacturing industry (Yuan and Cao, 2022), as well as the connection amid stakeholder pressure and GI within the SME sector (Singh et al., 2022). While the role of GEO as a predictor variable in relation to GI and green competitive advantage has been studied in the manufacturing sector (Zameer et al., 2022). However, mediating mechanism of GDC and GEO between the GTL and GI remains largely unanswered within the hospitality industry. In the absence of integrative research, this work responds to scholars' recurrent calls to uncover the mediating processes that explain how GTL effect GI in the hospitality industry (Begum, Ashfaq, et al., 2022; Cui et al., 2023). Exclusively, this is the first investigation to explore this dual mediation pathway. By carrying out this study, it contributes to the existing body of knowledge in the realm of GI and paves the way for further academic exploration.

Lastly, the current scientific literature lacks practical research that focuses on innovation and ecological concerns (Appiah et al., 2023; Khanra et al., 2022). Particularly, the connections between GI, GP, and CA have not been widely explored in the hospitality industry. Studies into GI and GP has also yielded conflicting results (Awan et al., 2023). By allowing businesses to utilize GI techniques, the implementation of certain strategies can be facilitated however, the potential for increased profits from these strategies remains uncertain (Zhang et al., 2023). Conversely, disregarding the potentiality that profits may not be enhanced (Yu et al., 2023). Recent study has shown, however, that such interconnection may generate appalling performance because of augmented growth of time stretch and expenses involved (Yu et al., 2023). The conflicting results of these studies have aroused the interest of researchers in exploring the relationship between GI, GP, and CA in the service industry (Awan et al., 2023). Thus, the present study fills these gaps by examining the relationship using the NRBV theory and determining whether GI can provide luxury hotels with a competitive advantage and green performance.

Based on the previous discussion this study claims that only fragmented links have been researched for a few manufacturing and services industries including education, high-tech, and information technology. Furthermore, previous research has emphasized the significance of elucidating industry-specific characteristics. However, our understanding of the relationships between multiple complex features of organizational behaviour in the hospitality sector is limited. Here we posit our three primary research inquiries: *RQ1:* How is GTL associated with GI? *RQ2:* How much do GDC and GEO mediate the relationship between GTL and GI? *RQ3:* How GI is linked with GP and CA? The present study aims to test the underlying hypotheses by analysing multi-wave, multi-source data gathered from employees working in 65 luxury hotels situated in 19 different cities in Italy.

The novel contribution of this study is to conduct a thorough examination of previously unexplored connections using a dual path mediation model. This study highlights the intricate interplay of GDC, GEO, and GI to understand the contributing role of GTL on CA and GP. This approach considers the unique environmental challenges encountered in the hospitality industry while maintaining an analytical perspective that is distinct from the manufacturing sector. This study makes a valuable contribution by conducting an all-inclusive analysis of the crucial association by utilizing a mediation model in two studies that incorporates a research design with a time-lagged approach to obtain more generalized results.

2. Theoretical underpinning and conceptual framework

2.1. Natural resource-based view theory (NRBV)

The NRBV theory is of great significance in the field of strategic management as it allows for the investigation of product and process innovation as a method to overcome environmental limitations. According to (Hart, 1995) NRBV, it is crucial for organizations to prioritize their association with the environment and pursue sustainable development in order to attain a sustainable competitive advantage. This can be conducted by implementing three interrelated strategies: sustainable development, product stewardship and pollution prevention (AlNuaimi et al., 2021). First, a sustainable development strategy prioritizes the development of products and processes that have minimal environmental impact (Begum, et al., 2022). Second, the product stewardship strategy aims to minimize the environmental impacts of products throughout their entire life cycle. This includes assessing the environmental effects at various stages such as sourcing raw materials, product manufacturing, operation, and the disposal of used products. Third, the goal of the pollution prevention strategy is to mitigate waste and decrease emissions and contaminations in business operation (Begum, et al., 2022). These strategies serve as the fundamental basis for green innovation aimed at preserving the natural environment and promoting the use of energy in ecologically sustainable ways (De Stefano et al., 2016). Green innovation refers to the process of creating environmentally friendly products and implementing environmentally friendly processes to address and mitigate the negative impact on the environment caused by the inefficient use of natural resources (Aftab et al., 2023). Scholars and environmental experts contend that the adoption of GI has the potential to enhance an organization's financial profitability and overall sustainability over an extended period (Begum, et al., 2022).

Within the context of environmental issues, GTL has placed a strong emphasis on raising awareness and motivation inside the organization to effectively achieve environmental goals (Chen and Chang, 2013). GTL

encompasses a range of intangible resources including skills in motivation and inspiration as well as the capacity to generate innovative ideas in support of environmental goals (Singh et al., 2020). GTL is an asset within a business that serves as a foundation for the creation and advancement of new products (Chen and Chang, 2013). The extent to which a company is willing and capable of achieving environmental objectives is primarily determined by the connection between GTL and green innovation (Ahmad et al., 2022).

The concept of Natural Resource-Based View (NRBV) encompasses the examination of the environmental impact resulting from the use of organizational resources as well as the processes and products derived from these resources (Andersen, 2021). However, the utilization of organizational resources (i.e., GTL) and essential competencies (i.e., GDC & GEO) is crucial (Sarkis et al., 2010). Drawing on insights from the NRBV, our research suggests the existence of a relationship between GTL and the development of green innovation. Our study highlights the importance of using GTL as a valuable resource and emphasizes how NRBV can enable hotel managers to find innovative solutions to reduce waste, lower emissions, and tackle contamination problems in their operations. Furthermore, this approach can facilitate the development of environmentally friendly products and processes by fostering green innovation within the hotel industry. Our study also posit that these resources and capabilities enhance the organizational green dynamic capabilities (GDC) and green environmental orientation (GEO) of a hotel. The current research posits that the GTL facilitated by GDC and GEO contributes to the advancement of GI which can result in better GP and CA of the service industry (Begum, et al., 2022).

2.2. Conceptual framework

The current study employs Hart (1995) theory of the natural resource based view (NRBV) to construct a conceptual framework aimed at comprehending the determinants that facilitate the attainment of GI within the hospitality sector. Based on previous research, we posit that GTL is a significant GI catalyst. Furthermore, the variables of CA and GP are considered as outcomes of GI. Subsequently, we ascertain GDC and GEO serving as the mediating factors between GTL and GI as strong competencies that steer environmental practices and facilitate productive collaborations and resource exchanges within hotel organizations. In this context, we suggest a direct association between GTL-GI, GTL-GDC, and GTL-GEO accordingly alongside that of GDC-GI, GEO-GI and GI with GP and CA. In addition, recognizing the intricate nature of this domain, we suggest a mediation framework to examine the mediating influence of GDC and GEO on the correlation among GTL and GI. The proposed full conceptual model is presented in study 2 (See Fig. 2).

3. Hypotheses development

3.1. Green transformational leadership and green innovation

Green transformational leadership (GTL) refers to a leadership behavior that encourages and motivates followers to exceed anticipated levels of environmental performance (Chen and Chang, 2013). GTL leaders prioritize creating an environmentally friendly atmosphere and encourage staff to stay informed about changing market conditions (Begum, Ashfaq, et al., 2022). They foster the cognitive and affective resilience required to create, disseminate, and execute environmentally friendly endeavors (Begum, et al., 2022). Past research suggests that GTL has a substantial impact on fostering innovation within organizations (Begum, et al., 2022).

A number of variables have been recognized as important contributors to green innovation in previous research, such as the implementation of green knowledge management in manufacturing organizations (Abbas and Khan, 2023), green human resource management (Rehman et al., 2021) and green intellectual capital in large manufacturing companies (Cui et al., 2023), external information-sharing in manufacturing firms Zhang et al. (2020) and green transformational leadership in high tech industry (Begum, et al., 2022). Gürlek and Koseoglu (2021) discussed that the examination of GI in the hospitality and tourism field is still in its nascent stages as it is a relatively unexplored area within the literature. Therefore, this analysis

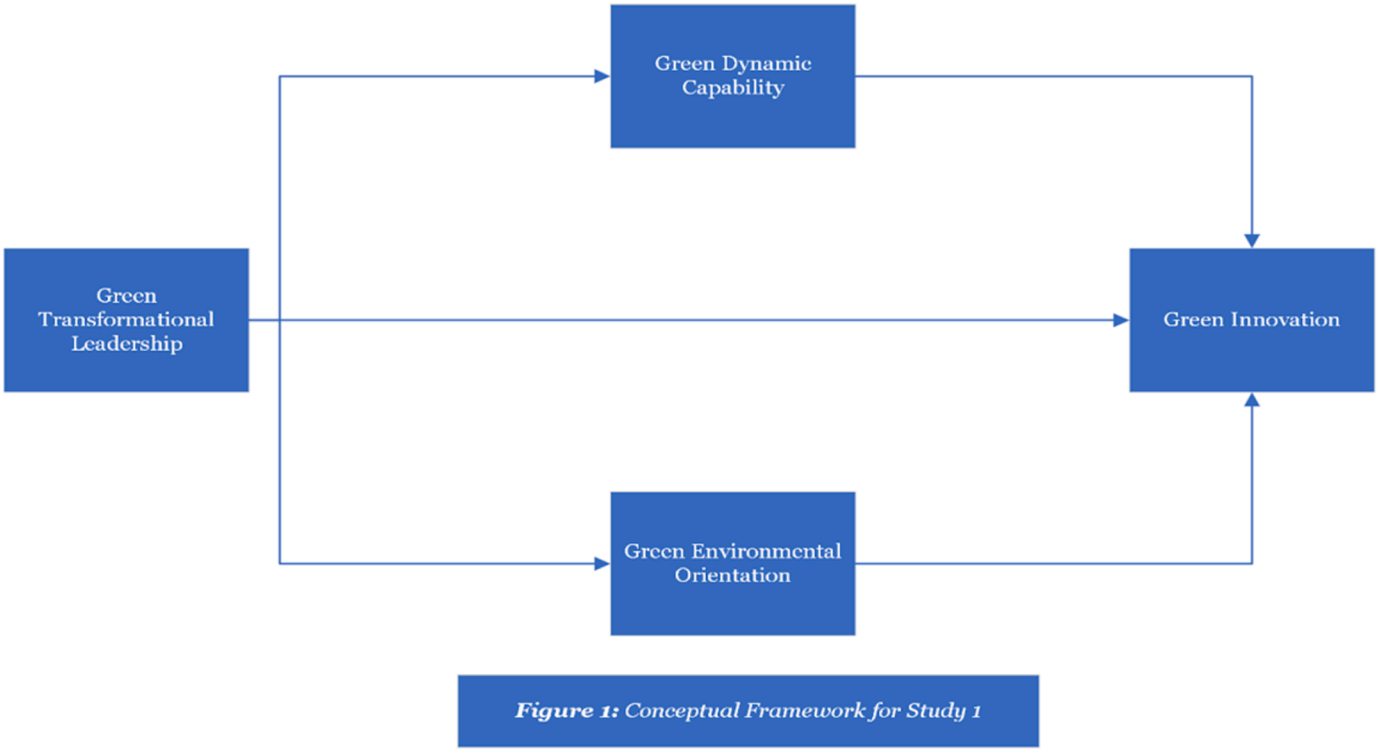

Fig. 1. Conceptual Framework for Study 1.

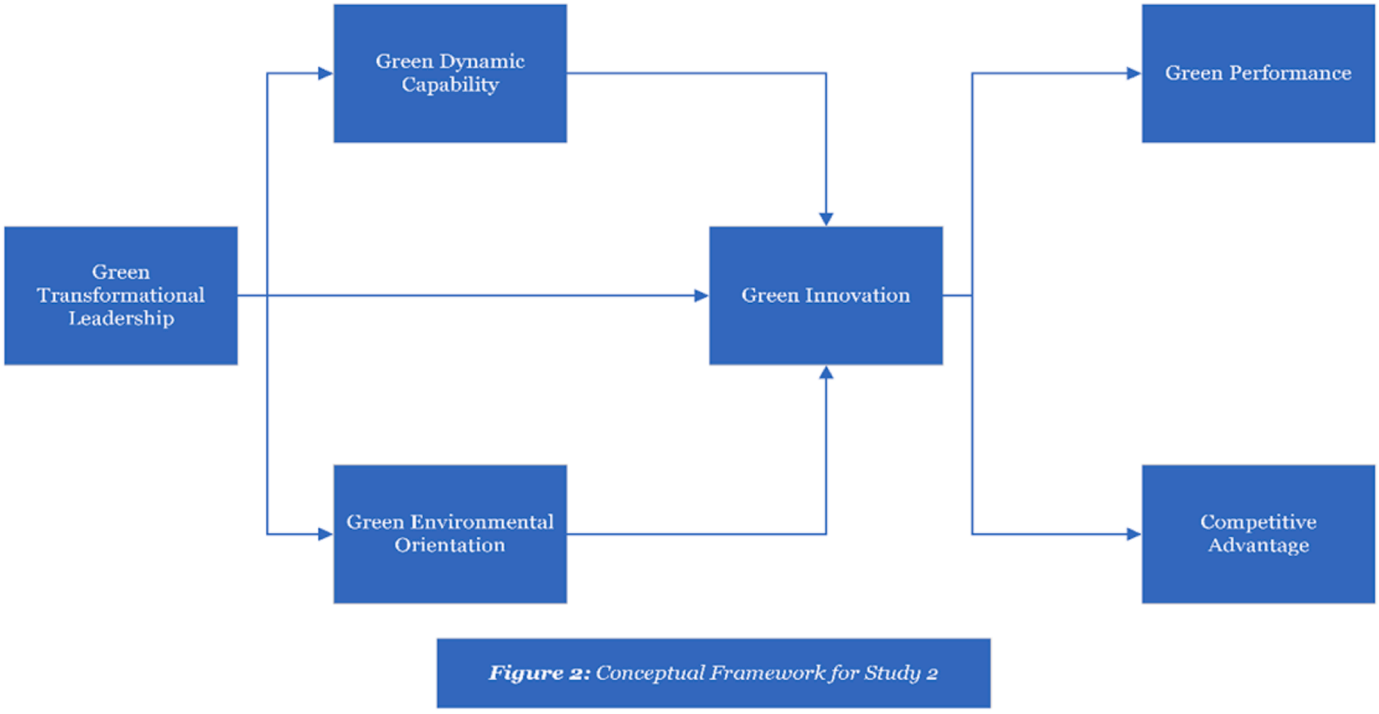

Fig. 2. Conceptual Framework for Study 2.

provides researchers with a valuable opportunity to explore the impact of GTL on GI in the Italian hospitality sector which has not been thoroughly examined before. Thus, we expect GTL to play a significant role in promoting environmentally friendly practices and providing the necessary resources for green innovation in the hospitality industry. We therefore put forth the following hypothesis.

H1. : Green transformational leadership positively impacts on green innovation.

3.2. Green transformational leadership, green dynamic capability and green innovation

The term green dynamic capability (GDC) is used to describe an organization's propensity to recognize favorable and unfavorable conditions in its external environment, pursue tailored procedures and assets to respond to fluctuating market conditions, and influence its surroundings via integrating green knowledge and cooperation (Teece, 2007). A substantial body of evidence suggests that organizations can improve their environmental performance through green innovation and the production of less hazardous products and processes if they achieve a certain level of GDC (Yuan and Cao, 2022). This argument raises the crucial issue of how these GDCs are cultivated, particularly in the hospitality industry. Previous research has demonstrated that the function of top leaders' styles is crucial for the development of dynamic capabilities of organizations (Ahmad et al., 2022). However, with a pro-environment perspective, green transformational leaders can build and renew particular GDCs necessary for environmentalism (Ahmad et al., 2022). In the prior literature, it has been discovered that leadership is a crucial factor in developing the GDC required to promote GI in SMEs (Ahmad et al., 2022). However, little research has been done on the connection between GTL and GDC in the hospitality industry. It is deemed valuable to obtain a more detailed comprehension of how GTL can catalyze GDC in the service (hotel's) industry. This association can also be considered plausible based on the theoretical proposition of NRBV, which posits that the utilization of organizational resources (GTL) and essential competencies (GDC) is crucial (Sarkis et al., 2010) for eco-environmentalism.

GDC is seen as a prerequisite for GI as shown by the research of (Ahmad et al., 2022). Prior studies have shown that organizational GDC's guarantees GI in a variety of industries that is linked to product or process including the advancement in contributing to massive amounts of trash remanufacturing, enterprise environmental conservation, energy-saving, pro-environmental design, and pollution prevention (Singh and Chaudhary, 2023; Yuan and Cao, 2022). Hence, GDC has a favorable effect on GI because of their ability to detect, collect, and predict market demand for green products, shifts in green technology, and policies about the adoption of GI (Ahmad et al., 2022). GDC will only be distinguishable and generate a lasting competitive advantage if firms effectively transform them into green innovation (Ahmad et al., 2022). Despite this, there is a continued requirement for the development of empirical evidence of a mediation linkage between GTL and GI (Begum, et al., 2022). This information serves as a foundation for exploring potential indirect effects beyond the suggested direct impact of (a) GTL on GDC and (b) GDC on GI. It is posited that an alternative mechanism may exist to explain this association potentially involving the fundamental green knowledge and competencies possessed by hospitality organizations. Hence, we propose:

H2. : Green transformational leadership positively impacts green dynamic capabilities.

H2a. Green dynamic capabilities positively impact on green innovation.

H2b. Green dynamic capabilities positively mediate between the green transformational leadership and green innovation.

3.3. Green transformational leadership and green environmental orientation and green innovation

In the management literature, there seems to be general agreement that top management plays a pivotal role because of the significant influence they have over the firm's environmental performance (Niazi et al., 2023). Previous studies have demonstrated that the most effective strategy for attaining an organization's environmental goals is by adopting a leadership style commonly known as GTL (Chen and Chang,

2013). Environmental consciousness and orientation tend to be higher among leaders with a greater degree of openness (Niazi et al., 2023). Prior studies have examined the impact of GTL in conjunction with CSR (Niazi et al., 2023) and GTL and organizational green learning (Cui et al., 2023). Little research has been done on connection between GTL and GEO in Italian hospitality industry. In order to address the existing gap in the management literature, this research aims to investigate the association between GTL and GEO. Gaining a more comprehensive understanding of how GTL can enhance GEO is considered to be of significant importance for hospitality industry. The plausibility of this association can also be justified by the theoretical proposition of the NRBV which argues that the effective utilization of organizational resources (i.e., GTL) and core competencies (i.e., GEO) is essential for the implementation of eco-environmental practices (Zameer et al., 2022).

The adoption of GI has garnered significant recognition from both industry professionals and academic scholars as an effective approach to mitigating environmental challenges (Begum, et al., 2022). The implementation of cost-effective GI in the production of products and processes enables enterprises to adhere to environmental regulations and fulfil their social obligations (Zameer et al., 2022). Based on empirical research, it has been found that organizations that hold ISO 14001 certification may not be able to effectively improve their environmental performance. On the other hand, organizations that are committed to environmental sustainability should continuously strive to improve and innovate their methods for enhancing production processes (Palmié et al., 2023). Yet, it is still unclear if the GEO of hospitality organizations may also promote GI (Palmié et al., 2023). The existing body of literature suggests that further investigation is required to ascertain the mediating factors that link GTL and GI (Begum, et al., 2022).Thus, the present study suggests that hotels with an environmental orientation are more likely to accomplish GI. We assert, based on prior research, that GEO mediates between GTL and GI in the context of hospitality.

H3. **:** Green transformational leadership positively impacts influences green environmental orientation.

H3a. Green environmental orientation positively impacts green innovation.

H3b. Green environmental orientation positively mediates between green transformational leadership and green innovation.

3.4. Green innovation and green performance

Research in organizational behavior has shown that placing a strong emphasis on ecological performance can effectively reduce waste and promote the redesign of products and processes, ultimately leading to a significant decrease in environmental impact (Awan et al., 2023). Due to its lower costs and reduced waste, GI has the potential to yield social, ecological, and financial benefits (Gu, 2022). GI is an essential component of any organization, as it is closely linked to the organization's environmental strategy (Aftab et al., 2023). Many scholarly sources have highlighted a significant correlation between GI and green performance (Aftab et al., 2023; Singh et al., 2020).

Past studies have shown that the green performance of organizations is affected by different factors. These factors include the quality of environmentally friendly products, the adoption of eco-friendly processes, and the incorporation of ecological sustainability into operations and product development (Asadi et al., 2020; Dubey et al., 2015; Singh et al., 2019). GI has often been perceived as a reaction to stakeholder pressures. However, the notion that organizations should actively strive to improve their environmental performance to gain a competitive advantage has been put forth by some scholars (Kratzer et al., 2017; Singh et al., 2020). Similarly, Singh et al. (2020) conducted a study and discovered that a company's green performance is impacted by its involvement in green innovation activities. Given these factors, it can be argued that there is a correlation between GI and GP (Singh et al., 2020). Thus, we suggest.

H4. : Green innovation positively impacts on green performance.

3.5. Green innovation and competitive advantage

The adoption of green innovation (GI) presents organizations with new opportunities to differentiate themselves from their competitors by improving product design and quality, while also achieving cost reductions through energy-saving measures and enhancing resource efficiency (Asadi et al., 2020). Prior studies have shown that utilizing GI can greatly benefit organizations by increasing their market dominance and gaining a competitive advantage over their competitors (Kuo et al., 2022; Wang, 2022; J. Wang et al., 2020). An organization's main competitive advantage stems from its distinct resources and competencies according to NRBV theory (Begum, Ashfaq, et al., 2022). The optimal performance of these resources and capabilities is achieved when they are scarce, difficult to obtain, immobile and unique (Begum, Ashfaq, et al., 2022). Zameer et al. (2022) suggests that implementing GI can enhance an organization's competitive advantage in the market in three different ways. Initially, the development of distinctive goods and amenities by GI is aimed at creating higher customer value (Gürlek and Koseoglu, 2021). In addition, incorporating GI into business practices can aid in establishing a favorable reputation, portraying the organization as socially responsible and beneficial to both society and customers (Papadas et al., 2019). Furthermore, by utilizing GI businesses can realize cost savings, increased efficiency and improved product quality (Zameer et al., 2022). Previous discussion lays a strong foundation for us to suggest that hotels that possess extraordinary and distinctive assets and skills in relation to GI will experience a favorable effect on their competitive edge within the hospitality sector. Therefore, we propose the following hypothesis.

H5. : Green innovation positively impacts competitive advantage.

4. Research methodology

4.1. Research overview

We conducted two studies to test our mediation model using a time-lagged research design. The samples included managers and employees from the Italian hospitality industry. The first study investigated a dual-path mediated model utilizing three-wave time-lagged data, featuring a two-week gap between each wave. At T1, we conducted measurements on GTL, while at T2, we assessed GDC and GEO. Finally, during T3, we assessed GI. In Study 2, we utilized the complete mediation model. Data were collected using a two-wave time-lagged approach, with a four-week delay between each wave. We performed measurements of GTL, GDC, and GEO at T1. We evaluated GI, GP, and CA at T2.

4.2. Methodology for study 1

By employing a time-lagged study methodology, Study 1 was undertaken to empirically examine our mediated model. Hospitality personnel situated in Italy participated in an online survey that was administered via the Prolific data collection service. The current investigation was carried out in three discrete stages, with a two-week break between each stage. Previous studies in the field of leadership have proposed a two-week break between successive rounds of data gathering (Rasheed et al., 2023). Information was collected from a sample of 347 participants at time point 1 (T1) regarding the GTL approach utilized by their supervisor. Information was collected from a sample of 347 participants at time point 1 (T1) regarding the GTL approach utilized by their supervisor. Information regarding the GDC and GEO was requested from the 347 participants at the second time point (T2). At the second time point (T2), information was gathered from 321 participants who were asked to offer ratings on GDC and GEO. At the second time point

Table 1
Previous studies on (Types) Leadership and (Types) Innovation.

Author (s)/ Year	Leadership (Types)	Mediator	Moderator	Green Innovation (Types)	Control Variable	Industry	Country	Findings
Begum, Ashfaq, et al. (2022)	Green Transformational Leadership	Creative process engagement and green thinking	N/A	Green innovation	Employee experience, firm size, Firm age, Industry Type	High-tech industry	China	The study's findings highlight the significant impact of GTL on fostering green thinking, enhancing CPE and green innovation towards sustainability. The findings indicate that green thinking and CPE mediate the relationship between GTL and GI.
Idrees et al. (2023)	Leadership and management support	Green knowledge acquisition	Green absorptive capacity	Radical green innovation and Incremental green innovation	Firm type, ownership, firm size, and firm age	Large size manufacturing firms	Pakistan	The research results indicate that both radical and incremental green innovation are highly influenced by leadership and management support, with incremental green innovation being more positively impacted compared to radical green innovation. Green knowledge acquisition serves as a partial mediator between leadership and management support, as well as radical and incremental green innovation. The results also show that the influence of green knowledge acquisition on leadership and management support, as well as GI, is more significant when there is a high level of green absorptive capacity.
Shehzad et al. (2024)	Knowledge oriented leadership and Green entrepreneurial orientation	Knowledge creation, knowledge acquisition, knowledge sharing and knowledge application	N/A	Green product innovation and green process innovation	Firm size	Manufacturing enterprises	Pakistan	The findings indicate that KM enablers have a significant impact on two key areas of GI: green product and process innovation, as well as KM processes. In addition, KM processes significantly boost two aspects of GI.
Cui et al. (2023)	Green Transformational Leadership	Organizational green learning	N/A	Radical green innovation	N/A	Manufacturing industry	China	Green transformational leadership fosters the R-I ratio, which has an inverted U-shaped correlation with radical green innovation. The findings indicate that green R&D investment has a U-shaped moderating effect on the association between green transformational leadership and R-I ratio. Additionally, environmental regulatory pressure positively moderates the link between green

(*continued on next page*)

Table 1 (*continued*)

Author (s)/ Year	Leadership (Types)	Mediator	Moderator	Green Innovation (Types)	Control Variable	Industry	Country	Findings
								transformational leadership and R-I ratio.
Pham et al. (2023)	Green Transformational Leadership	Green supply chain learning	N/A	Green Product innovation and green process innovation	N/A	Construction firms	Vietnam	The findings suggest that transformational leadership has a favorable impact on both green learning and green innovation, specifically in terms of green product innovation and green process innovation. Additionally, green learning has a beneficial influence on green process innovation. Moreover, research has discovered that green learning acts as a mediator in the relationship between transformational leadership and green process innovation.
Şengüllendi et al. (2023)	Ethical leadership	Green organizational culture	N/A	Green Product innovation and green process innovation	N/A	SMEs	Turkey	The findings suggest that transformational leadership has a favourable impact on both green learning and green innovation, specifically in terms of green product innovation and green process innovation. Additionally, green learning has a beneficial influence on green process innovation. Moreover, research has discovered that green learning acts as a mediator in the relationship between transformational leadership and green process innovation.
Akhtar et al. (2023)	Responsible leadership	organizational ethical culture	Strategic posture	Green Product innovation and green process innovation	Gender, age, education, experience	Hospitality Organizations	Pakistan	Evidence indicates that responsible leadership has a favourable impact on the development of environmentally friendly innovations. The findings provide evidence for the mediating influence of organizational ethical culture and the moderating impact of strategy posture on the direct relationship between responsible leadership and green innovation. Specifically, the direct effect of responsible leadership on green innovation is more pronounced in situations where there is a progressive strategic posture.

(*continued on next page*)

Table 1 (*continued*)

Author (s)/ Year	Leadership (Types)	Mediator	Moderator	Green Innovation (Types)	Control Variable	Industry	Country	Findings
Tian et al. (2023)	Digital Leadership	Green organizational identity	digital threat and technology for social-good	Radical green innovation	N/A	Manufacturing Industry	China	This study found that the four dimensions of DL favorably affect RGI and that GOI partially mediates this relationship. DT negatively moderates DL and GOI, whereas TSG positively regulates them. DT and TSG connection moderates GOI's partial mediating role in DL and RGI.
Chen et al. (2023)	Green transformational leadership	Green knowledge sharing	Innovation climate	Green Product innovation and green process innovation	N/A	Mega projects	China	GTL boosts green product and process innovation (GPDI and GPCI). Additionally, GKS mediates GTL and the two GI components. In addition, IC positively moderates the link between GTL and GKS and GKS and the two GI features.
(Begum, Xia, et al., 2022)	Green transformational leadership	Creative process engagement	N/A	Green Product innovation and green process innovation	N/A	High tech Manufacturing Industries	China	The findings showed that green transformational leadership and creative process engagement boost green product and process innovation. Similarly, green transformational leadership boosts creative process engagement. Further, creative process engagement mediates between green transformational leadership and green process and product innovation.
Singh et al. (2020)	Green transformational leadership	Green HRM practices	N/A	Green Product innovation and green process Innovation and environmental performance	N/A	SMEs	UAE	The study found that green transformational leadership improves environmental performance and green innovation. Additionally, green HRM practices mediate between green transformational leadership, innovation, and environmental performance.
He et al. (2023)	Environmental leadership	Proactive environmental strategy	Organizational structure	Green Product innovation and green process innovation	education, firm size, and ownership structure	Metal Enterprises, Mining Industry, Printing Industry, Food, and Beverage Industries	China	The results of the study indicate that environmental leadership has a beneficial effect on the performance of green product innovation as well as green process innovation. Additionally, proactive environmental strategies play a key role in mediating the relationship between environmental leadership and green innovation

(*continued on next page*)

Table 1 (*continued*)

Author (s)/ Year	Leadership (Types)	Mediator	Moderator	Green Innovation (Types)	Control Variable	Industry	Country	Findings
								performance. This includes both green product innovation performance and green process innovation performance.

(T2), information was gathered from 321 participants who were asked to offer ratings on GDC and GEO. The same 321 subjects were requested to assess (T3) GI, two weeks after the T2 wave. As of T3, the study comprised a cohort of 321 individuals. After identifying the multivariate outliers, 18 responses were excluded, resulting in 303 valid responses for further analysis.

4.3. Respondents profile for study 1

The Prolific IDs of the respondents were employed as exclusive codes to correspond and integrate the data they had furnished in the three waves. Out of the total sample size of 303 participants, 62.4% were males and 37.6% of them identified as female. Additionally, it was found that 35.6% of the sample population fell within the age range of 30–39 years, while 24.8% were between the ages of 20 and 29 years. Furthermore, 48.2% of the participants held a master's degree, while 40.9% possessed between 11 and 15 years of work experience in the hospitality sector.

4.4. Methodology for study 2

We employed a time-lagged method and analysis of mediation to thoroughly assess our entire model. We obtained information for Study 2 from Italian hospitality industry employees by utilizing the Prolific data collection service. The second study was carried out in two distinct stages, with a one-month gap in between them. Previous research on leadership has indicated a one-month time lag between consecutive data collection periods (Khan et al., 2021). In the initial stage of data collection (T1), 401 participants were surveyed for metrics related to GTL, GDC, and GEO. Additionally, demographic information such as city, age, level of education, gender, and total experience in the hospitality industry was collected from the respondents. During the T2 stage, four weeks after the initial phase, we asked the 401 participants who had participated in the T1 wave to provide information about GI, GP, and CA. A total of 360 respondents were included in the T2 survey. 349 individuals out of the total number of participants provided responses that were considered suitable for analysis. 349 responses were included in the final analyses after excluding eleven that were deemed multivariate outliers.

4.5. Respondents profile for study 2

The Prolific IDs of the respondents were employed as distinct codes to correspond and consolidate the data they had furnished in the two waves. 63.3% were males and 36.7% of the 349 survey participants were female. Additionally, 35.2% of respondents were between the ages of 30 and 39 and 25.8% were in the ranges of 20 and 29. In addition, 38.4% had 11–15 years of experience in the hotel industry, and 47.6% had master graduates.

4.6. Instrumentation

The survey was created by utilizing questions from prior research and drawing from the green transformational leadership literature to adopt and/or amend six items (Chen and Chang, 2013). To evaluate green environmental orientation, we utilized the five items from (Banerjee, 2002; Keszey, 2020). We evaluated the green dynamic capabilities of Italian luxury hotels by employing seven items from (Chen and Chang, 2013; Yousaf, 2021) assessment framework. Green innovation was based on a set of eight items that were derived from (Chen et al., 2006; Soewarno et al., 2019) work. The measurement of green performance involved the use of nine items sourced from (Wang, 2019; Yu et al., 2017). The competitive advantage was evaluated using two dimensions - innovation differentiation and market differentiation based on four items adapted from (Chandler and Hanks, 1994; Wang, 2019; Zhou et al., 2009). The participants evaluated each item using a

Table 2
Instrumentation and operational definitions.

Variables	Operational Definitions	Sources
Green Transformational Leadership	Green transformational leadership refers to a type of leadership behavior that focuses on providing a crystal-clear vision, guidance, and inspiration to hotel employees. The main objective of this leadership style is to support the developmental needs of employees and help them achieve the environmental goals of the hotel.	Chen and Chang (2013)
Green Environmental Orientation	Green Environmental orientation denotes organizational responsibility toward the environment, demonstrating recognition of the impact that a hotel may have on the ecological environment and a willingness to minimize such influence.	(Banerjee, 2002; Keszey, 2020)
Green Dynamic Capabilities	The term green dynamic capability pertains to a hotel's ability to recognize advantageous and disadvantageous circumstances in its external surroundings, adopt personalized strategies and resources to adapt to changing market conditions, and impact its environment through green product and process innovations and cooperation.	(Chen and Chang, 2013; Yousaf, 2021)
Green Innovation	The term green innovation pertains to the development of products and processes within the hotel industry that prioritize energy conservation, pollution mitigation, waste management, and the creation of green product designs.	(Chen et al., 2006; Soewarno et al., 2019)
Green Performance	The term green performance pertains to the evaluation of the relationship between a hotel and its surrounding environment.	(Wang, 2019; Yu et al., 2017)
Competitive Advantage	Competitive advantage refers to a hotel's superior market position that allows it to outperform its competitors.	(Chandler and Hanks, 1994; Wang, 2019; Zhou et al., 2009)

five-point Likert-type scale, with options ranging from 1 (strongly disagree) to 5 (strongly agree). Table 2 presents the operational definitions and sources for the variables that were studied.

5. Data analysis techniques

Various techniques were utilized to examine the data and validate the hypotheses. For the data screening process, we employed various methods, including missing values analysis, multivariate outlier detection, data normality assessment, descriptive statistics, and correlation analysis. We focused on identifying hospitality professionals who had at least twelve months of continuous, full-time work experience. Both studies employed the same data screening criteria.

5.1. Common method Bias (CMB) and multi-collinearity

In order to reduce the potential for bias, this study implemented the procedural precautions outlined by (Podsakoff et al., 2003). *First,* pretesting of the survey was conducted throughout the questionnaire development phase, aiming to identify areas for improvement in the survey design and items to alleviate the respondents' workload. Furthermore, the questionnaire was designed with a deliberate separation between the independent and dependent variables. The items were also randomized to eliminate any bias towards specific responses. Therefore, any phrasing or layout of variables that could have resulted in a priming effect was deliberately avoided. *Second,* a single factor test by Harman was administered. The test yielded no immediate issues as a singular component accounted for 38.6% of the variation in the sample, which was significantly lower than the 50% criterion. Thus, there was no cause for concern regarding common method bias (Volberda et al., 2012). Furthermore, an examination was conducted on the bivariate correlations among the constructs, which revealed comparatively weak correlations ($r > 0.90$) (Lowry and Gaskin, 2014). Lastly, we assessed the vertical as well as lateral collinearity between each construct by evaluating the variance inflation factors (VIFs) (Kock, 2015). Kock (2015, p. 7) states that a thorough collinearity test can be used to evaluate the bias of common methods in studies employing structural equation modeling. By examining the VIFs, we can determine whether the model is unaffected by common method bias. The model appears to be impartial if the VIFs are 3.30 or lower. Given that the maximum VIF from the full collinearity test was below 3.30 (ranging from 1.472 to 2.915), it can be concluded that there were no issues regarding common method bias in the sample of this study.

5.2. Testing measurement model (Study 1)

In Study 1, skewness, kurtosis, and the variance inflation factor were analyzed to explore potential issues of collinearity. The skewness of all variables was found to be below 3 and the kurtosis was below the 10th threshold, indicating that the data was approximately normally distributed according to (Kline, 2011). The variance inflation factor values ranged from 1.00 to 2.50 (< 5), indicating that there are no significant issues with multicollinearity, as all values are less than 5 (Hair et al., 2017). Anderson and Gerbing (1988) proposed the standards for assessing convergent validity. Ringle et al. (2018) recommended the model fit index should be employed to assess the quality of data. The measurement model for study 1 exhibited an adequate level of fit: $\chi2=692.591$, df=309, $\chi2/df=3.425$, goodness-of-fit index (GFI)=0.984, adjusted goodness-of-fit index (AGFI)=0.891, non-normed fit index (NFI)=0.836, comparative fit index (CFI)=0.973, incremental fit index (IFI)=0.907, root mean square residual (RMSR)=0.037 and root mean square error of approximation (RMSEA)=0.072. Hu and Bentler (1999) proposed that the model would be deemed acceptable if the GFI and AGFI values were greater than 0.8. Overall, the measurement model used in this study was deemed satisfactory (Baumgartner and Homburg, 1996).

Additionally, the study evaluated the internal consistency of the Study 1 model by employing Cronbach's alpha and composite reliability (CR) measures. Moreover, the study investigated the model's convergent and discriminant validity by examining outer loadings, average variance extracted (AVE), and discriminant validity criteria, as specified by (Hair et al., 2017). To ensure the internal consistency of the study, Cronbach's alpha and CR must be greater than 0.6 (Nunnally, 1967). Table 3 displays the internal consistency. The AVE ratings that were above 0.5 and used to assess convergent validity Hair et al. (2017) were kept, while GDC1, GEO4, and GI2 were removed. All external loads greater than 0.6 have been kept for data analysis (Hair et al., 2017).

Study 1 confirmed the convergent and discriminant validity by ensuring that the intra-construct correlations were stronger than the inter-construct correlations (Hair et al., 2017). We evaluated the discriminant validity by examining the heterotrait-monotrait ratios (HTMT) and found that all values were below 0.85, as suggested by (Hair et al., 2017). Study 1 successfully demonstrated discriminant validity testing. (See Table 4)

5.3. Testing structural model (Study 1)

Following Hair et al. (2017) we examined R^2 values and Stone Geisser's Q^2 values to gauge the explanatory and predictive capability of the proposed model. The R^2 values of 0.25, 0.50, and 0.75 indicate weak, moderate, and substantial explanatory power, respectively. Furthermore, Q^2 values greater than zero indicate that the model has satisfactory predictive power (Hair et al., 2017). This study demonstrated sufficient explanatory and predictive capabilities, as evidenced by the results for green dynamic capability (GDC) ($R^2 = 0.69$, $Q^2 = 0.49$), green environmental orientation (GEO) ($R^2 = 0.61$, $Q^2 = 0.43$), green innovation (GI) ($R^2 = 0.73$, $Q^2 = 0.51$).

The structural model was scrutinized in a phase-by-phase manner, with all hypotheses being examined thoroughly. The impact of T1- GTL on T3- GI was initially assessed. Study 1 examined the causal relationship among T1-GTL and T2-GDC as well as T2-GEO, which was followed by the impact of T2-GDC and T2-GEO on T3-GI. In order to determine the importance of direct paths and estimated mean errors, 5000

Table 3
Item Loadings, Reliability, and Convergent Validity.

	M (SD)	Λ	α	CR	AVE
Green Transformational Leadership			0.907	0.929	0.684
GTL1	3.87 (1.07)	0.860			
GTL2	3.85 (1.09)	0.872			
GTL3	3.78 (1.08)	0.830			
GTL4	3.73 (1.04)	0.826			
GTL5	3.80 (1.03)	0.799			
GTL6	3.71 (1.15)	0.773			
Green Dynamic Capability			0.875	0.906	0.615
GDC2	3.41 (1.15)	0.750			
GDC3	3.40 (1.12)	0.763			
GDC4	3.30 (1.02)	0.756			
GDC5	3.50 (1.07)	0.827			
GDC6	3.62 (1.09)	0.836			
GDC7	3.45 (1.02)	0.771			
Green Environmental Orientation			0.789	0.864	0.615
GEO1	3.75 (1.19)	0.819			
GEO2	3.78 (1.02)	0.817			
GEO3	3.35 (1.12)	0.686			
GEO5	3.55 (1.17)	0.807			
Green Innovation			0.878	0.905	0.579
GI1	3.58 (1.07)	0.684			
GI3	3.16 (1.19)	0.714			
GI4	3.11 (1.12)	0.804			
GI5	3.09 (1.14)	0.833			
GI6	3.02 (1.17)	0.809			
GI7	3.23 (1.18)	0.809			
GI8	3.37 (1.11)	0.655			

Table 4
Discriminant Validity (HTMT).

	T1- GTL	T2- GDC	T2- GEO	T3- GI
T1- GTL				
T2- GDC	0.652			
T2- GEO	0.646	0.780		
T3- GI	0.408	0.771	0.810	

Note: All HTMT values are < 0.85.

bootstrap resamples were employed (Ringle, 2005).

As evident in Table 5, there is a positive and statistically significant effect of T1-GTL.on T3- GI (β = 0.258, t = 3.58, p = 0.010), therefore, H1 is supported.

Additionally, it is evident that T1- GTL has a positive and significant impact on T2- GDC (β = 0.588, t = 13.70, p < 0.000) and T2- GEO (β = 0.556, t = 11.12, p < 0.000). The findings indicate that hypotheses H2 and H3 are validated.

it was confirmed in study 1 that T2-GDC (β = 0.475, t = 9.00, p < 0.000) and T2-GEO (β = 0.463, t = 8.19, p < 0.000) had a positive and significant effect on T3-GI. Thus, Table 5 provides support for H2a and H3a.

5.4. Study 1: mediation analysis

In Study 1, the aim was to investigate whether T2-GDC and T2-GEO play a mediating role in the relationship between T1-GTL and T3-GI, as suggested by Hypotheses H2b and H3b. The findings suggest that when the mediator was added to the model, a positive and statistically significant direct effect was observed. (β=.258, t= 3.78, p=.010). The study uncovered a statistically significant indirect effect for T2-GDC (β=0.279, t= 8.07, p<.001) and T2-GEO (β=0.257, t= 6.24, p<.001). The results of the first study suggest a partial mediation effect. These results demonstrate that the impact of T1-GTL on T3-GI is partially mediated by T2-GDC and T2-GEO in the first study. (See Table 6)

5.5. Testing measurement model (Study 2)

Study 2 evaluated skewness, kurtosis, and the variance inflation factor to explore any potential issues with collinearity. The multivariate normality of all variables was supported by their skewness and kurtosis, both of which were below the 3 and 10 thresholds, respectively (Kline, 2011). The variance inflation factor values ranged from 1.00 to 3.76, with all values being less than 5, suggesting that there are no significant issues with multicollinearity (Hair et al., 2017). The measurement model for study 2 demonstrated sufficient fit, as indicated by the results χ2=893.709, df=341, χ2/df=3.719, GFI=0.941, AGFI=0.860, NFI=0.931, CFI=0.974, IFI=0.952, RMSR=0.049 and RMSEA=0.081. According to Hu and Bentler (1999), the model would be considered acceptable if the GFI and AGFI values were greater than 0.8. The measurement model employed in this study was found to be acceptable (Baumgartner and Homburg, 1996).

Table 5
Structural Equation Model.

Hypotheses	Relationships	Sample Mean	Standard Deviation	T statistics	P values
H1	T1 - GTL -> T3 - GI	0.258	0.061	3.58	0.010
H2	T1 - GTL -> T2 - GDC	0.588	0.043	13.70	0.000
H2a	T2 - GDC -> T3 - GI	0.475	0.053	9.00	0.000
H3	T1 - GTL -> T2 - GEO	0.556	0.050	11.12	0.000
H3a	T2 - GEO -> T3 - GI	0.463	0.056	8.19	0.000

The study examined the Study 2 model by first assessing its internal consistency using Cronbach's alpha and composite reliability (CR) measures. Furthermore, the study evaluated the model's convergent and discriminant validity by examining outer loadings, average variance extracted (AVE), and the discriminant validity criterion, as specified by (Hair et al., 2017). In order to ensure the study's internal consistency, the values of Cronbach's alpha and CR must surpass the minimum threshold level of 0.6, as specified by (Nunnally, 1967). Table 7 presents findings that demonstrate a high level of internal consistency. To assess the convergent validity, we analyzed the AVE scores. The results indicate that all the AVE values surpass the threshold of 0.5, which is considered the minimum acceptable value according to (Hair et al., 2017). The study also assessed the reliability of the indicators by evaluating the outer loadings. Values greater than 0.6 were considered appropriate for further data analysis, following the methodology described by (Hair et al., 2017). In this stage, it was noted that none of the items were removed as their factor loadings met or exceeded the suggested threshold of 0.6.

After confirming the convergent validity, Study 2 moved on to assess the discriminant validity (See Table 7) by ensuring that the intra-construct correlation was higher than the inter-construct correlations, as specified by (Hair et al., 2017). To evaluate discriminant validity, we examined the heterotrait-monotrait ratios (HTMT), which all fell below 0.85 (Hair et al., 2017). Study 2 successfully demonstrated discriminant validity testing (See Table 8).

The latent variable scores were utilized as manifest variables to generate the second-order constructs (Hair et al., 2021). The assessment of innovation differentiation and market differentiation's validity and reliability was conducted using standard criteria for evaluating measurement models, which encompassed reliability, convergent validity, and discriminant validity. The regression results showed that the weights for the two first-order constructs on the second-order constructs, namely innovation differentiation and market differentiation, exhibited positive weights of 0.13 and 0.81, respectively. On the second-order composite of competitive advantage, the regression weights of innovation differentiation (0.71) and market differentiation (0.55) were positive.

5.6. Structural model evaluation of study 2

Based on the study conducted by Hair et al. (2017) we conducted an evaluation of the R^2 values and Stone Geisser's Q^2 values to determine the effectiveness of the proposed model in terms of explanation and prediction. The R^2 values of 0.25, 0.50, and 0.75 indicate weak, moderate, and strong explanatory power, respectively. When Q^2 values are greater than zero, it suggests that the proposed model has acceptable predictive capability (Hair et al., 2017). The results of this study demonstrate sufficient explanatory and predictive capabilities concerning green dynamic capability (GDC) ($R^2 = 0.81$, $Q^2 = 0.51$), green environmental orientation (GEO) ($R^2 = 0.74$, $Q^2 = 0.47$), green innovation (GI) ($R^2 = 0.78$, $Q^2 = 0.43$) green performance (GP) ($R^2 = 0.70$, $Q^2 = 0.56$) and competitive advantage (CA) ($R^2 = 0.71$, $Q^2 = 0.45$).

The structural model was analyzed through a methodical evaluation of each hypothesis, which was carried out sequentially. An assessment was carried out on the impact of T1- GTL on T2- GI which was followed by T1- GDC, and T1- GEO impact on T2- GI in Study 2. In addition, the study also evaluated the impact of T2-GI on T2-GP and T2-CA. The use of 5000 bootstrap resamples was employed to assess the applicability of direct pathways and estimated average errors, as suggested by(Ringle, 2005).

T1- GTL has a positive and statistically significant impact on T2- GI, as displayed in Table 9 (β = 0.209, t = 3.42, p = 0.001). H1 is supported in study 2.

Furthermore, it is evident that T1- GTL has a positive and significant impact on T1- GDC (β = 0.899, t = 47.73, p < 0.000) and T1- GEO (β = 0.893, t = 38.48, p < 0.000). The results indicate that hypotheses H2

Table 6
Mediation outcomes.

Total effect (T1- GTL-> T3 - GI)		Direct effect (T1- GTL-> T3 - GI)		Indirect Effects of T1- GTL on T3- GI				
Coefficient	**p-value**	**Coefficient**	**p-value**		**Coefficient**	**SD**	**T value**	**P- Values**
0.378	0.000	0.258	.010	**H2b: T1 - GTL -> T2 - GDC -> T3 – GI**	0.279	0.034	8.07	0.000
				H3b: T1 - GTL -> T2 - GEO -> T3 - GI	0.257	0.041	6.24	0.000

Table 7
Item Loadings, Reliability, and Convergent Validity.

	M (SD)	Λ	α	CR	AVE
Green Transformational Leadership			0.911	0.931	0.693
GTL1	4.24 (1.10)	0.812			
GTL2	3.98 (1.16)	0.831			
GTL3	4.04 (1.12)	0.861			
GTL4	3.95 (1.14)	0.830			
GTL5	4.03 (1.16)	0.851			
GTL6	3.93 (1.21)	0.809			
Green Dynamic Capability			0.933	0.946	0.714
GDC1	3.91 (1.15)	0.822			
GDC2	4.12 (1.13)	0.855			
GDC3	4.01 (1.18)	0.832			
GDC4	4.03 (1.21)	0.873			
GDC5	4.10 (1.19)	0.852			
GDC6	3.89 (1.23)	0.847			
GDC7	3.80 (1.20)	0.833			
Green Environmental Orientation			0.910	0.933	0.737
GEO1	4.39 (1.14)	0.775			
GEO2	4.02 (1.18)	0.891			
GEO3	3.93 (1.16)	0.890			
GEO4	4.08 (1.12)	0.860			
GEO5	4.03 (1.14)	0.872			
Green Innovation			0.937	0.948	0.696
GI1	4.04 (1.16)	0.857			
GI2	4.08 (1.13)	0.883			
GI3	3.92 (1.21)	0.824			
GI4	4.03 (1.21)	0.860			
GI5	4.30 (1.11)	0.834			
GI6	4.18 (1.16)	0.765			
GI7	4.32 (1.04)	0.808			
GI8	4.26 (1.06)	0.837			
Green Performance			0.949	0.957	0.711
GP1	4.10 (1.05)	0.782			
GP2	4.04 (1.16)	0.874			
GP3	3.94 (1.15)	0.854			
GP4	3.92 (1.13)	0.847			
GP5	3.93 (1.21)	0.861			
GP6	3.93 (1.26)	0.870			
GP7	3.83 (1.30)	0.821			
GP8	3.84 (1.23)	0.840			
GP9	4.12 (1.18)	0.838			
Competitive Advantage			0.872	0.912	0.723
Innovation Differentiation					
ID1	4.02 (1.15)	0.859			
ID2	4.13 (1.16)	0.907			
Market Differentiation					
MD1	3.75 (1.15)	0.803			
MD2	3.81 (1.16)	0.830			

Table 8
Discriminant Validity (HTMT).

	T1- GDC	T1- GEO	T1- GTL	T2- CA	T2- GI	T2- GP
T1- GDC						
T1- GEO	0.789					
T1- GTL	0.776	0.782				
T2- CA	0.604	0.621	0.743			
T2- GI	0.571	0.597	0.563	0.732		
T2- GP	0.521	0.525	0.521	0.643	0.746	

Note: All HTMT values are < 0.85.

Table 9
Structural equation model.

Hypotheses	Relationships	Sample Mean	Standard Deviation	T statistics	P values
H1	T1 - GTL -> T2 - GI	0.209	0.061	3.42	0.001
H2	T1 - GTL -> T1 - GDC	0.899	0.019	47.73	0.000
H2a	T1 - GDC -> T2 - GI	0.305	0.062	4.85	0.000
H3	T1 - GTL -> T1- GEO	0.893	0.023	38.48	0.000
H3a	T1- GEO -> T2 - GI	0.455	0.062	7.37	0.000
H4	T2 - GI -> T2 - GP	0.893	0.020	45.60	0.000
H5	T2 - GI -> T2 - CA	0.844	0.029	29.62	0.000

and H3 have been validated.

In study 2, it was demonstrated that T1-GDC ($\beta = 0.305$, $t = 4.85$, $p < 0.000$) and T1-GEO ($\beta = 0.455$, $t = 7.37$, $p < 0.000$) have a positive and significant effect on T2-GI. Therefore, H2a and H3a are both substantiated.

In study 2, the impact of T2-GI on T2-GP ($\beta = 0.893$, $t = 45.60$, $p < 0.000$) and T2-GI on T2-CA ($\beta = 0.844$, $t = 29.62$, $p < 0.000$) was confirmed. As a result, H4 and H5 are supported.

5.7. Study 2 mediation analysis

In study 2, the assessment of T1-GDC and T1-GEO is carried out to examine their potential role in mediating the correlation between T1-GTL and T2-GI, as suggested by H2b and H3b. The findings suggest that the incorporation of the mediator in the model led to a significant and positive direct effect (β=.209, t= 0.889, p=.001). Positive and significant indirect effects were observed for T1-GDC (β=0.274, t=4.888, p<.001) and T1-GEO (β=0.406, t=7.238, p<.001), accordingly. Therefore, the findings indicate that there is partial mediation in study 2. This indicates that the influence of T1- GTL on T2- GI in study 2 is partially passed via T1- GDC and T1- GEO. (See Table 10)

5.8. Assessing the predictive relevance using PLS Predict

The R^2 statistics mentioned earlier indicate the model's explanatory power within the sample. We have utilized PLS Predict to assess the out-of-sample predictive relevance of our model for CA (Shmueli et al., 2016). This is based on the principles of using training samples, which are a subset of the data set used to estimate the model, and holdout samples, which are the remaining portion of the data set not used for parameter estimation (Hair et al., 2019; Shmueli et al., 2016). PLS Predict is a procedure that utilizes holdout samples to generate predictions at the case or item level. This indicates that PLS Predict can evaluate the precision of a model while simultaneously predicting the result value of new cases (Shmueli et al., 2016). Following the recommendations provided by Shmueli et al. (2019) and Hair et al. (2019) on the assessment of our model's predictive significance, we commenced the PLS Predict procedure with 10 folds ($k = 10$). The training sample in each fold was carefully verified to ensure that it still satisfied the

Table 10
Mediation Outcomes.

Total effect (T1- GTL-> T2 - GI)		Direct effect (T1- GTL-> T2 - GI)		Indirect Effects of T1- GTL on T2- GI				
Coefficient	p-value	Coefficient	p-value		Coefficient	SD	T value	P Values
0.889	0.000	0.209	.001	**H2b: T1 - GTL -> T1 - GDC -> T2 – GI**	0.274	0.056	4.888	0.000
				H3b: T1 - GTL -> T1 - GEO -> T2 - GI	0.406	0.057	7.238	0.000

minimal sample size criteria, as determined by (Kock and Hadaya, 2018) and calculated using G* Power software. Firstly, the study analyzed the Q^2 Predict values of the PLS-SEM model. The positive Q^2 Predict value, shown for CA, suggests that the PLS-SEM analysis for indicators of our main target construct performs better than the simplest benchmark linear regression model (LM) (i.e. the average values of the indicators from the training sample). Subsequently, the study analyzed the dispersion of estimate errors in our model and observed an asymmetrical distribution. Therefore, we utilized the mean absolute error (MAE) data acquired for partial least squares structural equation modeling (PLS-SEM) in conjunction with the LM benchmark. Table 11 clearly shows that the MAE values for most of the indicators in the PLS-SEM analysis had reduced prediction errors compared to the LM. This indicates that our model has a moderate level of predictive capacity (Shmueli et al., 2019).

6. Discussion

By applying the theoretical framework of the natural resource-based view (NRBV) (Hart, 1995), it has been proposed that GTL leaders who are considered valuable assets to an organization can develop distinct abilities such as implementing GDC, GEO and GI in hotels. This can lead to gaining a competitive advantage and enhancing green performance. The findings indicate that GTL can inspire and motivate individuals to actively support GI through their involvement in environmentally friendly initiatives and strategies (Ahmad et al., 2022). Effective communication and promotion of an organization's environmentally sustainable activities increase the likelihood of employees engaging in ecologically responsible actions (Begum, Ashfaq, et al., 2022; Zheng et al., 2023). The GTL strategy places a high importance on achieving the business's objectives while also considering the distinctive requirements of employees (Zheng et al., 2023). It offers training to assist individuals in developing and sharing environmentally friendly ideas and strategies that minimize the hotel's carbon emissions and use of conventional products (Chen et al., 2023).

Second, the findings suggest that there is a positive correlation between GTL,GDC and GEO which is also consistent with the theoretical framework of the NRBV (Hart, 1995). The concept of NRBV emphasizes the ability of companies, particularly those in the hospitality industry such as hotels, to develop and leverage specific capabilities (Y. Wang et al., 2020) such as GDC and GEO to effectively manage natural resources and advance green initiatives. This finding suggests that GTL, as a hotel's vital resource, has the potential to enhance the GDC and GEO of luxury hotels. Therefore, hotels with GTL leadership are more likely to increase their GDC (Yuan and Cao, 2022) and GEO (Cui et al., 2023). In other words, hotels that aspire to enhance their GDC and GEO must possess GTL.

Thirdly, our study discovered that the results of our mediation analysis in both investigations were identical. The findings of studies 1 and 2 confirm the substantial positive impact of GTL on GI, GTL on GDC, GTL on GEO, GDC on GI and GEO leading to a notable enhancement in GI. Thus, demonstrates partial mediation. The findings suggest that GTL fosters a culture of environmental consciousness within the organization thereby promoting the development of GI behavior (Begum, et al., 2022; Pham et al., 2023). The results indicate that GTL has a significant impact on GDC, GEO and GI. The findings are in line with prior studies conducted outside of the hospitality industry (Ahmad et al., 2022; Begum, et al., 2022). Furthermore, it is posited that the association between GTL and GI is partially mediated by GDC and GEO. This implies that GTL has the potential to exert a direct impact on GI as well as an indirect positive impact through GDC and GEO. The implementation of GTL contributes to the promotion of the organization's environmental consciousness and engages its employees in innovative approaches to address the issue of environmental degradation (Zheng et al., 2023). The enhancement of CA and GP in the hotel industry is a result of organizations' enhanced ability to acquire, implement and increase their comprehension of GI.

Lastly, this study provides a novel and distinct contribution to the existing body of knowledge on hospitality and green innovation. It explores the role of GDC and GEO as mediators between GTL and green innovation which has never been examined in the hospitality industry. In other words, GDC and GEO catalyze to translate the impact of GTL on encouraging green innovation in organizations (Ahmad et al., 2022). In summary, the potential explanation for the mediation effects lies in the stimulation of an organization's capacity to acquire, comprehend, create, integrate and utilize novel environmentally sustainable values and green knowledge which subsequently encourages the adoption of green approaches and techniques. As a result, the idiosyncratic influence of GTL on GI exhibits an exponential increase (Chen et al., 2023). Therefore, the incorporation of GTL, GDC, GEO and GI in the investigation holds great significance in enhancing environmental well-being which is currently lacking in the available hospitality literature.

Table 11
Assessment for predictive relevance for competitive advantage.

	PLS-SEM		LM	PLS-SEM – LM
Items of the dependent variable	**MAE**	**Q^2 Predict**	**MAE**	**MAE**
ID1	0.859	0.28	0.921	–0.062
ID2	0.958	0.224	0.958	–0.032
MD1	0.756	0.355	0.778	–0.019
MD2	0.801	0.307	0.834	–0.009

6.1. Theoretical implications

The study has significant theoretical implications for the domains of hospitality, organizational behavior, GTL and GI. First, the present study elucidates that GTL facilitates organizational GI and offers novel perspectives on how the hospitality industry can enhance extant practices to foster GI thereby yielding CA and GP (Elgarhy and Abou-Shouk, 2023). Academics have observed that GDC and GEO are essential for innovation (Singh et al., 2022; Zameer et al., 2022). This study validates prior research and explores two alternative pathways - GDC and GEO that link GTL and organizational GI in the hospitality industry.

Second, the study shows that GTL acts as a significant precursor to GI which in turn represents an improved manifestation of GI behavior. Consequently, our contribution expands the existing body of hospitality research, which has primarily concentrated on confirming the correlation between transformative leadership and organizational innovation (Sliwka et al., 2024). Academics have primarily focused on measuring innovation from the employee perspective when examining the variables that affect GTL and GI (Begum, et al., 2022). The hospitality industry is experiencing a growing interest in focusing on sustainable development and environmentally friendly practices. Our research

shows that implementing GTL practices can improve organizational GI and provide guidance on fostering GDC and GEO of organizations.

Third, the study emphasizes the impact of GTL on GI, which is further enhanced by the mediating effects of GDC and GEO. Effective collaboration between the GDC and GEO is essential for promoting positive organizational behavioral change, especially in the field of green innovation that has wide-reaching benefits for the community. Furthermore, it enhances the competitive advantage and green performance of hotels. Moreover, previous research conducted within the context of GTL has demonstrated that leaders possess significant power to impact behavioral outcomes, including commitment of employees, green creativity, and innovation. (Begum, et al., 2022; Bhutto et al., 2021; Singh et al., 2020). Nevertheless, there is a dearth of academic investigation into the impact of leadership style on green innovation, particularly when considering these mediating elements within the hospitality sector. Consequently, our work provides novel theoretical perspectives within the hospitality context.

Finally, our study contributed to the extant literature by extending the NRBV theory Hart (1995) to better understand and explicate the determinants that influence GTL, GDC, GEO, GI, CA and GP. The concept of the NRBV was explored concerning the utilization of organizational competencies and resources by GTL to facilitate the promotion of GDC, GEO and GI within the hospitality industry. We therefore contended that GTL is a vital resource for the hotel organization. The primary obstacle faced by leaders is the task of recognizing, developing and utilizing critical resources and competencies (Ahmad et al., 2022). Our study indicates GTL as a strong organizational resource to promote competencies like GDC, GEO and GI which further enhances the CA and GP of hotel organizations.

6.2. Practical implications

In the face of global decarbonization efforts, it is crucial for every sector to embrace sustainable business practices. Hotels are not an exception. Our research offers practical insights for hospitality organizations to embrace GTL to promote green innovation to achieve their overarching goal of sustainability. The study highlights the importance of luxury hotel professionals in identifying, gathering, and forecasting market demand for environmentally friendly products. It also emphasizes the significance of staying informed about advancements in green policies and practices related to the implementation of green initiatives. This can result in significant improvements in green innovation and outcomes within the processes and products of the hospitality industry facilitated by effective green transformational leadership (Chen et al., 2023). First, based on the findings, it is evident that GTL has a substantial influence on GI. Our research strongly advocates for the implementation of GTL among hotel employees to promote GI in the Italian hospitality industry. It is advisable for hotels that strive for ethical business conduct to give precedence to GTL conduct (Farooq et al., 2022). We have discovered that the behavior of leaders who prioritize sustainability initiatives can greatly contribute to the growth and development of green innovation. Hence, hotel organizations must provide priority and encourage the implementation of GTL techniques by their executives to boost their eco-friendly endeavors. By implementing comprehensive environmental strategies, effectively communicating an ecological vision, fostering open dialogues about environmental responsibility, cultivating positive interpersonal relationships with hotel staff, and motivating employees to contribute and develop innovative green ideas, hotel managers can promote environmentally sustainable practices within their organizations (Begum, et al., 2022). Second, it is imperative for hotels to improve their GDC and GEO to attain GI. GDC and GEO play a crucial role in facilitating the acquisition, comprehension, creation, integration, dissemination, conversion and utilization of novel environmentally sustainable values and green knowledge. The allocation of resources and acquisition of necessary capabilities are crucial for the successful implementation of green practices. These capabilities play a vital role in fostering green innovation (Yuan and Cao, 2022). In the operational context of a hotel or services sector, managers must recognize the significance of GDC and GEO. This awareness enables them to effectively manage and guide the strategic direction of green innovation practices rather than solely reacting to external pressures such as meeting environmental regulations or addressing environmental concerns in services industries. In addition, it is anticipated that the incorporation of environmental orientation and green dynamic capability will emerge as significant performance indicators for a hotel's/ services industries green innovation. We recommend that organizations should consider investing in environmental management as a means of enhancing their reputation among all stakeholders. The increasing demand for GI is placing pressure on services industries to adopt environmentally friendly practices across all aspects of their operations, including processes, products, and services (Cui et al., 2023).

Finally, GI can play a pivotal role in facilitating and advancing sustainable development initiatives within the hotel (service) industry (Kim et al., 2023). GI plays a crucial role in mitigating the environmental impact of a hotel's operational activities. By enhancing resource efficiency and leveraging technology, GI not only contributes to reducing the hotel's carbon footprint but also enhances its brand reputation. Additionally, GI implementation leads to cost savings and ensures compliance with regulatory standards. By promoting sustainable practices luxury hotels can contribute to long-term competitive advantage, mitigate their environmental impact and achieve green performance.

6.3. Limitations and future research directions

This study highlights several limitations and potential areas for future research. First, a comprehensive mediation model was employed to investigate the association between GTL and GI utilizing a study methodology that involved time-lagged data. The use of experimental design may yield divergent outcomes in subsequent investigations. Second, the survey was conducted at luxury resort hotels located in popular tourist destinations in Italy. Therefore, it is important to exercise cautiousness when generalizing our findings. Future research should consider various geographical factors and different types of hotels, considering their size and specific characteristics. Engaging in such endeavors will enhance the generalizability of the findings. Additionally, our model underwent evaluation in Italy, a culture known for its emphasis on individualism. In this context, the tourism industry, specifically the hotel segment, faces significant vulnerability to the imminent challenges presented by climate change. (Fermani et al., 2016). Conducting research in collectivistic communities has the potential to provide diverse outcomes.

6.4. Conclusion

This research aimed to investigate the extent to which GTL contributes to the support of GI in the hospitality industry through GDC and GEO. Subsequently, we performed a thorough analysis to assess the influence of GI on GP and CA in Italian luxury hotels. We employed the natural resource-based view framework (Hart, 1995) to elucidate the interconnection between the proposed framework. Based on our two research investigations, our study has discovered a positive and significant relationship between GTL, GDC, and GEO. Furthermore, these variables demonstrate a statistically significant correlation with the GI of hotel organizations. The research uncovered a significant impact of GI on both GP and CA within the Italian hospitality industry.

CRediT authorship contribution statement

Nadia Aslam Janjua: Conceptualization, Methodology, Writing – original draft. **Umar Farooq Sahibzada:** Data curation, Formal analysis, Software. **Da SHI:** Project administration, Supervision, Writing – review

& editing, Validation.

Declaration of Competing Interest

The authors have no competing interests to declare, relevant to the content of this article.

Appendix

Green Transformational Leadership

1. The leader inspires subordinates with the hotel's environmental plan.
2. The leader of the hotel provides subordinates with a clear environmental vision.
3. The leader of the hotel encourages subordinates to work on environmental plans.
4. The leader of the hotel encourages employees to attain environmental goals.
5. The leader of the hotel considers the environmental beliefs of subordinates.
6. The leader of the hotel stimulates subordinates to think & share their green ideas.

Green Dynamic Capabilities

1. Our hotel has the ability that can fast monitor the environment to identify new green opportunities
2. Our hotel has effective routines to identify and develop new green knowledge
3. Our hotel has the ability to develop green technology
4. Our hotel has the ability to assimilate, learn, generate, combine, share, transform, and apply new green knowledge
5. Our hotel has the ability to successfully integrate and manage specialized green knowledge within the company
6. Our hotel has the ability to successfully coordinate employees to develop green technology
7. Our hotel has the ability to successfully allocate resources to develop green innovation.

Green Environmental Orientation

1. Environmental issues are very relevant to the major function of our hotel
2. At our hotel, we make a concerted effort to make every employee understand the importance of environmental preservation
3. Our hotel tries to promote environmental preservation as a major goal across all department
4. Our hotel has a clear policy statement urging environmental awareness in every area of operations
5. Preserving the environment is a central corporate value in our hotel

Green Innovation

1. Our hotel has selected environmentally friendly raw materials in product development
2. Our hotel has used energy-efficient raw materials in product development
3. Our hotel has carried out the efficiency of raw materials for the production process in product development
4. Our hotel has evaluated that the product is easy to reuse, recycle, and decompose
5. Our hotel has effectively reduced the emission of hazardous substances or waste in the production process
6. Our hotel has effectively recycled waste and emissions in the production process
7. Our hotel has effectively reduced the consumption of water, electricity, or oil in the production process
8. Our hotel has effectively made innovations to reduce the use of raw materials in the production process

Green Performance

1. Our hotel conforms with the requirements of inputs of energy
2. Our hotel conforms with the requirements of community relations.
3. Our hotel conforms with the requirements of outputs of air emissions
4. Our hotel conforms with the requirements of indicators on the local, regional or national condition of the environment.
5. Our hotel conforms with the requirements of outputs of wastewater.
6. Our hotel conforms with expectations of implementation of environmental policies and programs
7. Our hotel has achieved important environment-related certifications.
8. Our hotel has regularly achieved targets for energy conservation, recycling or waste reductions.
9. On average, the overall environmental performance of our hotel has improved over the past five years.

Competitive Advantage

Innovation differentiation:

1. Our hotel is constantly investing to generate new capabilities that give us an advantage over our competitors.
2. Our hotel offers that there was a new way of serving customers.

Market differentiation:

1. It is difficult for our competitors to imitate us.
2. Nobody can copy our hotel's routines, processes and culture.

References

Abbas, J., Khan, S.M., 2023. Green knowledge management and organizational green culture: an interaction for organizational green innovation and green performance. J. Knowl. Manag. *27* (7), 1852–1870.

Aftab, J., Abid, N., Cucari, N., Savastano, M., 2023. Green human resource management and environmental performance: the role of green innovation and environmental strategy in a developing country. Bus. Strategy Environ. *32* (4), 1782–1798.

Ahmad, B., Shafique, I., Qammar, A., Ercek, M., Kalyar, M.N., 2022. Prompting green product and process innovation: examining the effects of green transformational leadership and dynamic capabilities. Technol. Anal. Strateg. Manag. https://doi.org/10.1080/09537325.2022.2071692.

Akhtar, M.W., Garavan, T., Javed, M., Huo, C., Junaid, M., Hussain, K., 2023. Responsible leadership, organizational ethical culture, strategic posture, and green innovation. Serv. Ind. J. *43* (7-8), 454–474.

AlNuaimi, B.K., Singh, S.K., Harney, B., 2021. Unpacking the role of innovation capability: exploring the impact of leadership style on green procurement via a natural resource-based perspective. J. Bus. Res. *134*, 78–88.

Andersen, J., 2021. A relational natural-resource-based view on product innovation: the influence of green product innovation and green suppliers on differentiation advantage in small manufacturing firms. Technovation *104*. https://doi.org/10.1016/j.technovation.2021.102254.

Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychol. Bull. *103* (3), 411.

Appiah, M., Li, M., Naeem, M.A., Karim, S., 2023. Greening the globe: uncovering the impact of environmental policy, renewable energy, and innovation on ecological footprint. Technol. Forecast. Soc. Change. https://doi.org/10.1016/j.techfore.2023.122561.

Arici, H.E., Cakmakoglu Arıcı, N., Altinay, L., 2023. The use of big data analytics to discover customers' perceptions of and satisfaction with green hotel service quality. Curr. Issues Tour. *26* (2), 270–288.

Asadi, S., Pourhashemi, S.O., Nilashi, M., Abdullah, R., Samad, S., Yadegaridehkordi, E., Aljojo, N., Razali, N.S., 2020. Investigating influence of green innovation on sustainability performance: a case on Malaysian hotel industry. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2020.120860.

Awan, F.H., Dunnan, L., Jamil, K., Gul, R.F., 2023. Stimulating environmental performance via green human resource management, green transformational leadership, and green innovation: a mediation-moderation model. Environ. Sci. Pollut. Res. *30* (2), 2958–2976.

Banerjee, S.B., 2002. Corporate environmentalism: the construct and its measurement. J. Bus. Res. *55* (3), 177–191.

Baumgartner, H., Homburg, C., 1996. Applications of structural equation modeling in marketing and consumer research: a review. Int. J. Res. Mark. *13* (2), 139–161.

Begum, S., Xia, E., Ali, F., Awan, U., Ashfaq, M., 2022. Achieving green product and process innovation through green leadership and creative engagement in manufacturing. J. Manuf. Technol. Manag. *33* (4), 656–674.

Begum, S., Ashfaq, M., Xia, E., Awan, U., 2022. Does green transformational leadership lead to green innovation? The role of green thinking and creative process engagement. Bus. Strategy Environ. *31* (1), 580–597.

Bhutto, T.A., Farooq, R., Talwar, S., Awan, U., Dhir, A., 2021. Green inclusive leadership and green creativity in the tourism and hospitality sector: serial mediation of green psychological climate and work engagement. J. Sustain. Tour. *29* (10), 1716–1737.

Chandler, G.N., Hanks, S.H., 1994. Market attractiveness, resource-based capabilities, venture strategies, and venture performance. J. Bus. Ventur. *9* (4), 331–349.

Chen, X., Chen, Y., Zhang, X., He, Q., 2023. Green transformational leadership and green innovation in megaprojects: is green knowledge sharing a missing link? Eng., Constr. Archit. Manag. https://doi.org/10.1108/ECAM-02-2023-0117.

Chen, Y.-S., Chang, C.-H., 2013. The determinants of green product development performance: green dynamic capabilities, green transformational leadership, and green creativity. J. Bus. Ethics *116*, 107–119.

Chen, Y.-S., Lai, S.-B., Wen, C.-T., 2006. The influence of green innovation performance on corporate advantage in Taiwan. J. Bus. Ethics *67*, 331–339.

Choudhary, P., Datta, A., 2023. Bibliometric analysis and systematic review of green human resource management and hospitality employees' green creativity. TQM J. https://doi.org/10.1108/TQM-07-2022-0225.

Cui, R., Wang, J., Zhou, C., 2023. Exploring the linkages of green transformational leadership, organizational green learning, and radical green innovation. Bus. Strategy Environ. *32* (1), 185–199.

De Stefano, M.C., Montes-Sancho, M.J., Busch, T., 2016. A natural resource-based view of climate change: innovation challenges in the automobile industry. J. Clean. Prod. *139*, 1436–1448. https://doi.org/10.1016/j.jclepro.2016.08.023.

Dubey, R., Gunasekaran, A., Ali, S.S., 2015. Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: a framework for green supply chain. Int. J. Prod. Econ. *160*, 120–132.

Elgarhy, S.D., Abou-Shouk, M., 2023. Effects of entrepreneurial orientation, marketing, and innovation capabilities, on market performance: the mediating effect of sustainable competitive advantage. Int. J. Contemp. Hosp. Manag. *35* (6), 1986–2004.

Farooq, R., Zhang, Z., Talwar, S., Dhir, A., 2022. Do green human resource management and self-efficacy facilitate green creativity? A study of luxury hotels and resorts. J. Sustain. Tour. *30* (4), 824–845.

Fermani, A., Crespi, I., Stara, F., 2016. Sustainable hospitality and tourism at different ages: women's and men's attitudes in Italy. Res. Hosp. Manag. *6* (1), 83–92.

Gu, S., 2022. Green innovation; a way to enhance economic performance of Chinese hotels. Int. J. Innov. Sci. *15* (3), 406–426.

Gürlek, M., Koseoglu, M.A., 2021. Green innovation research in the field of hospitality and tourism: the construct, antecedents, consequences, and future outlook. Serv. Ind. J. *41* (11-12), 734–766.

Hair Jr, J., Hair Jr, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., 2021. A primer on partial least squares structural equation modeling (PLS-SEM). Sage publications. https://doi.org/10.1007/978-3-030-80519-7.

Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Thiele, K.O., 2017. Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods. J. Acad. Mark. Sci. *45*, 616–632.

Hair, J.F., Risher, J.J., Sarstedt, M., Ringle, C.M., 2019. When to use and how to report the results of PLS-SEM. Eur. Bus. Rev. *31* (1), 2–24.

Hall, C.M., Safonov, A., Naderi Koupaei, S., 2023. Resilience in hospitality and tourism: issues, synthesis and agenda. Int. J. Contemp. Hosp. Manag. *35* (1), 347–368.

Hart, S.L., 1995. A natural-resource-based view of the firm. Acad. Manag. Rev. *20* (4), 986–1014.

He, S., Zhao, W., Li, J., Liu, J., Wei, Y., 2023. How environmental leadership shapes green innovation performance: a resource-based view. Heliyon *9* (7). https://doi.org/10.1016/j.heliyon.2023.e17993.

Hu, L. t, Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct. Equ. Model.: A Multidiscip. J. *6* (1), 1–55.

Idrees, H., Xu, J., Andrianarivo Andriandafiarisoa Ralison, N.A., Kadyrova, M., 2023. Does leadership and management support facilitate green knowledge acquisition and green innovation: a moderated mediation approach. Bus. Process Manag. J. *29* (4), 1249–1276.

Keszey, T., 2020. Environmental orientation, sustainable behaviour at the firm-market interface and performance. J. Clean. Prod. *243*, 118524 https://doi.org/10.1016/j.jclepro.2019.118524.

Khan, M.M., Mubarik, M.S., Islam, T., 2021. Leading the innovation: role of trust and job crafting as sequential mediators relating servant leadership and innovative work behavior. Eur. J. Innov. Manag. *24* (5), 1547–1568.

Khanra, S., Kaur, P., Joseph, R.P., Malik, A., Dhir, A., 2022. A resource-based view of green innovation as a strategic firm resource: present status and future directions. Bus. Strategy Environ. *31* (4), 1395–1413.

Kim, H., Yoon, J., Nicolau, J.L., 2023. Unveiling technological innovation in hospitality and tourism through patent data: development perspective and competition landscaping. Int. J. Hosp. Manag. *111*, 103478 https://doi.org/10.1016/j.ijhm.2023.103478.

Kline, R.B., 2011. Principles and practice of structural equation modeling, 3rd ed. The Guilford Press.

Kock, N., 2015. Common method bias in PLS-SEM: a full collinearity assessment approach. Int. J. e-Collab. (ijec) *11* (4), 1–10.

Kock, N., Hadaya, P., 2018. Minimum sample size estimation in PLS-SEM: the inverse square root and gamma-exponential methods. Inf. Syst. J. *28* (1), 227–261.

Kratzer, J., Meissner, D., Roud, V., 2017. Open innovation and company culture: internal openness makes the difference. Technol. Forecast. Soc. Change *119*, 128–138.

Kuo, F.-I., Fang, W.-T., LePage, B.A., 2022. Proactive environmental strategies in the hotel industry: eco-innovation, green competitive advantage, and green core competence. J. Sustain. Tour. *30* (6), 1240–1261.

Lee, C., Pung, J.M., Del Chiappa, G., 2022. Exploring the nexus of tradition, modernity, and innovation in restaurant SMEs. Int. J. Hosp. Manag. *100* https://doi.org/10.1016/j.ijhm.2021.103091.

Lowry, P.B., Gaskin, J., 2014. Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: when to choose it and how to use it. IEEE Trans. Prof. Commun. *57* (2), 123–146.

Mejia, C., Bąk, M., Zientara, P., Orlowski, M., 2022. Importance-performance analysis of socially sustainable practices in US restaurants: a consumer perspective in the quasi-post-pandemic context. Int. J. Hosp. Manag. *103* https://doi.org/10.1016/j.ijhm.2022.103209.

Muisyo, P.K., Su, Q., Hashmi, H.B.A., Ho, T.H., Julius, M.M., 2022. The role of green HRM in driving hotels' green creativity. Int. J. Contemp. Hosp. Manag. *34* (4), 1331–1352.

Niazi, U.I., Nisar, Q.A., Nasir, N., Naz, S., Haider, S., Khan, W., 2023. Green HRM, green innovation and environmental performance: the role of green transformational leadership and green corporate social responsibility. Environ. Sci. Pollut. Res. *30* (15), 45353–45368.

Nunnally, J.C., 1967. Assessment of reliability. Psychom. Theory 206–235.

Palmié, M., Rüegger, S., Holzer, M., Oghazi, P., 2023. The "golden" voice of "green" employees: the effect of private environmental orientation on suggestions for improvement in firms' economic value creation. J. Bus. Res. *156* https://doi.org/10.1016/j.jbusres.2022.113492.

Papadas, K.-K., Avlonitis, G.J., Carrigan, M., Piha, L., 2019. The interplay of strategic and internal green marketing orientation on competitive advantage. J. Bus. Res. *104*, 632–643.

Pham, H.T., Pham, T., Truong Quang, H., Dang, C.N., 2023. Impact of transformational leadership on green learning and green innovation in construction supply chains. Eng. Constr. Archit. Manag. *30* (5), 1883–1901.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. *88* (5), 879–903.

Priyadarshini, C., Chatterjee, N., Srivastava, N.K., Dubey, R.K., 2023. Achieving organizational environmental citizenship behavior through green transformational leadership: a moderated mediation study. J. Asia Bus. Stud. *17* (6), 1088–1109.

Rasheed, M.I., Hameed, Z., Kaur, P., Dhir, A., 2023. Too sleepy to be innovative? Ethical leadership and employee service innovation behavior: a dual-path model moderated by sleep quality. Hum. Relat. https://doi.org/10.1177/00187267231163040.

Rehman, S.U., Kraus, S., Shah, S.A., Khanin, D., Mahto, R.V., 2021. Analyzing the relationship between green innovation and environmental performance in large manufacturing firms. Technol. Forecast. Soc. Change *163*, 120481. https://doi.org/10.1016/j.techfore.2020.120481.

Ringle, C.M. (2005). SmartPLS 2.0 (M3). ⟨http://www.smartpls. de⟩.

Ringle, C.M., Sarstedt, M., Mitchell, R., Gudergan, S.P., 2018. Partial least squares structural equation modeling in HRM research. Int. J. Hum. Resour. Manag. *1* (1), 1–27.

Saqib, N., Abbas, S., Ozturk, I., Murshed, M., Tarczyńska-Łuniewska, M., Alam, M.M., Tarczyński, W., 2024. Leveraging environmental ICT for carbon neutrality: analyzing the impact of financial development, renewable energy and human capital in top polluting economies. Gondwana Res. *126*, 305–320. https://doi.org/10.1016/j.gr.2023.09.014.

Sarkis, J., Gonzalez-Torre, P., Adenso-Diaz, B., 2010. Stakeholder pressure and the adoption of environmental practices: the mediating effect of training. J. Oper. Manag. *28* (2), 163–176.

Şengüllendi, M.F., Bilgetürk, M., Afacan Fındıklı, M., 2023. Ethical leadership and green innovation: the mediating role of green organizational culture. J. Environ. Plan. Manag. 1–22. https://doi.org/10.1080/09640568.2023.2180347.

Shehzad, M.U., Zhang, J., Dost, M., Ahmad, M.S., Alam, S., 2024. Knowledge management enablers and knowledge management processes: a direct and configurational approach to stimulate green innovation. Eur. J. Innov. Manag. *27* (1), 123–152.

Shmueli, G., Ray, S., Estrada, J.M.V., Chatla, S.B., 2016. The elephant in the room: predictive performance of PLS models. J. Bus. Res. *69* (10), 4552–4564.

Shmueli, G., Sarstedt, M., Hair, J.F., Cheah, J.-H., Ting, H., Vaithilingam, S., Ringle, C. M., 2019. Predictive model assessment in PLS-SEM: guidelines for using PLSpredict. Eur. J. Mark. *53* (11), 2322–2347.

Singh, P., Chaudhary, K., 2023. Jharcraft: a gift of transformational leadership in an Indian state-owned enterprise. Int. J. Public Leadersh. https://doi.org/10.1108/IJPL-01-2023-0003.

Singh, S., FL, O., DB, P., BI, S., 2019. Innovation in the main Brazilian business sectors: characteristics, types and comparison of innovation. J. Knowl. Manag. *23* (1), 135–175. https://doi.org/10.1108/JKM-03-2018-0159.

Singh, S.K., Del Giudice, M., Chierici, R., Graziano, D., 2020. Green innovation and environmental performance: the role of green transformational leadership and green human resource management. Technol. Forecast. Soc. Change. https://doi.org/10.1016/j.techfore.2019.119762.

Singh, S.K., Del Giudice, M., Chiappetta Jabbour, C.J., Latan, H., Sohal, A.S., 2022. Stakeholder pressure, green innovation, and performance in small and medium-sized enterprises: the role of green dynamic capabilities. Bus. Strategy Environ. *31* (1), 500–514.

Sliwka, A., Klopsch, B., Beigel, J., Tung, L., 2024. Transformational leadership for deeper learning: shaping innovative school practices for enhanced learning. J. Educ. Adm. *62* (1), 103–121.

Soewarno, N., Tjahjadi, B., Fithrianti, F., 2019. Green innovation strategy and green innovation: the roles of green organizational identity and environmental organizational legitimacy. Manag. Decis. *57* (11), 3061–3078.

Teece, D.J., 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strateg. Manag. J. *28* (13), 1319–1350.

Tian, H., Han, J., Sun, M., Lv, X., 2023. Keeping pace with the times: research on the impact of digital leadership on radical green innovation of manufacturing enterprises. Eur. J. Innov. Manag. https://doi.org/10.1108/EJIM-11-2022-0647.

Volberda, H.W., Van Der Weerdt, N., Verwaal, E., Stienstra, M., Verdu, A.J., 2012. Contingency fit, institutional fit, and firm performance: a metafit approach to organization–environment relationships. Organ. Sci. *23* (4), 1040–1054.

Wang, C.-H., 2019. How organizational green culture influences green performance and competitive advantage: the mediating role of green innovation. J. Manuf. Technol. Manag. *30* (4), 666–683.

Wang, J., 2022. Building competitive advantage for hospitality companies: The roles of green innovation strategic orientation and green intellectual capital. Int. J. Hosp. Manag. *102*, 103161 https://doi.org/10.1016/j.ijhm.2022.103161).

Wang, J., Xue, Y., Sun, X., Yang, J., 2020. Green learning orientation, green knowledge acquisition and ambidextrous green innovation. J. Clean. Prod. *250* https://doi.org/10.1016/j.jclepro.2019.119475.

Wang, Y., Font, X., Liu, J., 2020. Antecedents, mediation effects and outcomes of hotel eco-innovation practice. Int. J. Hosp. Manag. *85*, 102345 https://doi.org/10.1016/j.ijhm.2019.102345.

Yousaf, Z., 2021. Go for green: green innovation through green dynamic capabilities: accessing the mediating role of green practices and green value co-creation. Environ. Sci. Pollut. Res. *28* (39), 54863–54875.

Yu, H., Wang, J., Hou, J., Yu, B., Pan, Y., 2023. The effect of economic growth pressure on green technology innovation: do environmental regulation, government support, and financial development matter? J. Environ. Manag. https://doi.org/10.1016/j.jenvman.2022.117172.

Yu, W., Ramanathan, R., Nath, P., 2017. Environmental pressures and performance: An analysis of the roles of environmental innovation strategy and marketing capability. Technol. Forecast. Soc. Change *117*, 160–169.

Yuan, B., Cao, X., 2022. Do corporate social responsibility practices contribute to green innovation? The mediating role of green dynamic capability. Technol. Soc. https://doi.org/10.1016/j.techsoc.2022.101868.

Zameer, H., Wang, Y., Yasmeen, H., Mubarak, S., 2022. Green innovation as a mediator in the impact of business analytics and environmental orientation on green competitive advantage. Manag. Decis. *60* (2), 488–507.

Zhang, X., Song, Y., Zhang, M., 2023. Exploring the relationship of green investment and green innovation: evidence from Chinese corporate performance. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2023.137444.

Zhang, Y., Sun, J., Yang, Z., Wang, Y., 2020. Critical success factors of green innovation: technology, organization and environment readiness. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2020.121701.

Zheng, Y., Gao, Y.L., Li, M., Dang, N., 2023. Leadership styles and employee pro-environmental behavior in the tourism and hospitality industry: a cognitive-affective personality system perspective. Int. J. Hosp. Manag. *113*, 103509 https://doi.org/10.1016/j.ijhm.2023.103509.

Zhou, K.Z., Brown, J.R., Dev, C.S., 2009. Market orientation, competitive advantage, and performance: a demand-based perspective. J. Bus. Res. *62* (11), 1063–1070.