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Green Intellectual Capital as A Catalyst for Sustainable Performance (An Empirical Investigation in The Pakistani Hotel Industry)

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The main objective of this study is to investigate how green intellectual capital impacts the accomplishment of sustainable performance along with the mediating significance of ambidextrous innovation and the moderating influence of environmental strategy. The study aimed to investigate the correlation among green intellectual capital, green ambidextrous innovation, and sustainable performance, along with the role of environmental strategy on this association. Data was gathered from 298 hotel employees in three cities of Pakistan through convenience sampling. The measurement and structure models have been analyzed using Smart PLS 3-SEM. Additionally, SPSS was used for demographic and descriptive analysis of the collected data. According to the study's results, it appears that green intellectual capital acts as a catalyst, while green ambidextrous innovation has a considerable influence on sustainable performance. Moreover, green ambidextrous innovation functions as an intermediary in the connection between green intellectual capital and sustainable performance. The findings also suggest that environmental strategy moderates negatively and weakens the link between green ambidextrous innovation and sustainable performance. This study has made several significant contributions to the existing literature on green intellectual capital and green ambidextrous innovation. One noteworthy aspect of this research is its focus on exploring the role of green intellectual capital in promoting the sustainability of businesses, with a specific emphasis on the hotel industry of Pakistan.

1-Introduction

Pakistan faces various issues associated with pollution and ecological destruction. As per a 2021 World Bank study, Pakistan ranks seventh among the most polluted countries, with an approximate expense of air pollution amounting to nearly 6% of GDP or Rs. 365 billion. These figures indicate the negative effect of pollution on the economy, society, and environment.

Accordingly Khuong and Linh (2020), in the 21st century tourism, telecommunication and technology are the three major industries. Around the world hospitality industry is fastest growing industry and it is providing economic and social benefits to society as a source of giving new experiences, providing jobs, expanding business travel, creating human and social capital. Another reality is that Pakistan placed 125th out of 165 nations in the Sustainable Development goals (SDG) index grading for 2022, achieving an overall score of 59.3%, mostly due to its progress on one of the 17 goals. This shows that performance sustainability is also a significant issue. The ultimate objective of all business organizations are to gain competitive advantage and this is not possible without getting the sustainability in performance (Ahmed et al., 2020).The area of performance sustainability got immense awareness among the researchers and practitioners because of negative impact of business organizations specifically hotel and tourism industry on society and ecology (Yusliza et al., 2020).Traditionally business concerns neglect the negative impact on society , economy and environment when they transform the resources into productive actions for their monetary benefits (Najmi et al., 2019).The concept of performance sustainability has bigger scope that covers the all three aspects economic, social and environmental, business concerns need to consider all these aspects during formulating their strategies and objectives (Ahmed et al., 2020).

Researchers emphasized green practices that support organizations' adoption of eco-friendly practices to address a variety of environmental concerns, including as air and water contamination, habitat destruction, and climate change. (Najmi et al., 2021).

Chen (2008) have proposed that spending in green intellectual capital (GIC), or intellectual property connected to environmental sustainability, is not only necessary for sustaining environmental management requirements but also a sign of sustainable performance. In order to enhance a company's capabilities, Goldin (2020) has underlined the significance of embracing the essential components of environmental strategy. Jiao et al (2022) proposed in their study that the business organizations need to develop green intellectual capital for performance sustainability. Scholars' theories about the association between green intellectual capital and overall productivity are contradictory. (Ullah et al., 2022). Asiaei et al. (2022) has been suggested that the components of green intellectual capital have not directly linked to a company's environmental performance. Only when ambidextrous green innovation is established as a mediating factor then the components of green intellectual capital be linked to a company's performance.(Asiaei et al., 2022). Ambidexterity enables organizations to acquire new knowledge and skills, contributing to

their sustainable performance. In pursuit of sustainability, green ambidextrous innovation focuses on providing sustainable innovations in products, services, systems, strategies, and procedures (Rennings, 2000 ; Li et al., 2018). Hospitality industry has also negative impact on economic, social, and environment by spreading pollution, waste, biodiversity and climate change (Chung & Parker, 2010). Research indicates that a company's environmental strategy can be either proactive or responsive (Aragón-Correa et al., 2008;Fousteris et al., 2018).Kraus et al. (2020) observed that the effect of green ambidexterity on a company's sustainable performance is significantly influenced by their environmental strategy. According to this study, a business's environmental strategy may act as the link between its performance and green ambidextrous innovation. To achieve sustainable performance in hotel industry, it is essential to pursuit green practices to enhance the efficiency of their operations and innovations (Jové-Llopis & Segarra-Blasco, 2018) (Kuo et al., 2022). The study examines that ambidextrous green innovation is causing to enhance the link between green intellectual capital and sustainability in the hotel industry in Pakistan. The researchers additionally analyze the moderating influence of environmental strategy on this connection. Green intellectual capital covers the information, skills, and experience essential for sustainability solutions in a company. Improved performance and sustainability can result from effective management of green intellectual capital, which includes green human, structural, and relational capital. Ambidextrous green innovation refers to the capability of a business to exploit existing green understanding while exploring new sustainable practices. The intervening role of ambidextrous green innovation is also highlights in this study between GIC and performance sustainability. Environmental strategy refers to all the steps, decisions and policies followed by an organization to overcome ecological issues. The moderating influence of environmental strategy on the relationship between GIC and performance sustainability is also investigated in the study. The outcomes of the study can help out the Pakistani hotel industry in enhancing its performance sustainability by effectively managing green intellectual capital through ambidextrous green innovation and environmental strategy. By integrating and balancing both exploitation and exploration, organizations can leverage their existing knowledge while also adapting to new sustainable practices. In conclusion, the study emphasizes the value of adopting ambidextrous green innovation and effective environmental strategies in managing green intellectual capital to improve performance sustainability in the hospitality segment in Pakistan.

This study has shed light on how green intellectual capital can contribute to sustainable performance, which is crucial in the current era of keen environmental concerns and give valuable insights into the optimization of the impact of green intellectual capital on sustainable performance. By identifying the mediating role of green ambidextrous innovation in this relationship, this research has underscored the importance of fostering a culture of innovation that promotes business sustainability. Additionally, it suggests that environmental strategy has a noteworthy role in moderating the link between green ambidextrous innovation and sustainable performance.

Overall, this research's contributions to the literature on green intellectual capital and green ambidextrous revolutions are significant, as it offers a unique perspective on the sustainability of businesses, particularly in the hotel industry of Pakistan. The insights provided by this research can be utilized by businesses to optimize their green intellectual capital and improve their sustainable performance, while simultaneously addressing environmental concerns.

2- Literature Review

2.1- Sustainable Performance

In recent years, scholars and practitioners have paid an increasing amount of attention to sustainability. There are several definitions and concepts used to describe sustainability in literature, but the triple bottom line notion is the most frequently employed and accepted one. (John Elkington, 1998). According to (Elkington, 1994) for a company to achieve sustainability, it must develop strategies and policies that encompass the well-being of all stakeholders, including its own financial interests. These concerns should prioritize environmental protection, ecological preservation, and conservation of natural resources, rather than considering them as additional expenses. Therefore, sustainability is supported by economic, social, and environmental sectors. Economic refers to the financial gains an organization derives from its operations, while social recognizes the company's role in improving the well-being of its stakeholders and the larger community. Environmental, on the other hand, reinforces the preservation of natural resources and mitigation of potential harm. (Ahmed et al., 2020) .The idea of sustainability aims to lessen the detrimental effects that business operations have on individuals and communities, social welfare, and economic growth as well as prevent the destruction of the environment for both the present and generations to come. M. N. A. M. Yusoff et al. (2021) stated that "sustainable development" refers to "development that satisfies the requirements of the present generation without jeopardizing the ability of future generations to meet their own needs". Since these expenditures give stakeholders the impression that an enterprise is really committed to environmental and social concerns, many organizations are engaging in green initiatives (Yusliza et al., 2020). Firms are now striving to meet the human community's demand for green goods and services by strategically utilizing diverse resources and reconciling the two fundamental pillars of business sustainability, namely, economic and environmental factors (Hamod & Majeed, 2021).

2.2- Green Intellectual Capital and Sustainable Performance:

Kamal et al. (2012) states that there are mainly three factors including employee aptitude, strengths, and competencies that can enhance organization's competitiveness. Maji and Goswami, (2016) states that Several assessments of intellectual capital have been performed. According to past studies, every organization wants to have sustainability in its performance as one of the most essential components, there isn't much research on intellectual capital for the economy. The available literature classifies intellectual capital into different components. It is divided into two, three, four, and five components. The three elements include human capital, structure capital, and

relational capital. Although there are many criteria to divide the components however, we will take three components in our study which are largely recognized.

In these days for all business organizations green practices are become so crucial to get sustainable performance (Yong et al., 2019). According to Yusoff et al.(2019);When a green component is included, the intellectual capital is considered to be "green," shifting it in direction of green intellectual capital (Chen, 2008; Chen, 2008a; Yusliza et al., 2020). The GIC divided into ternary components (Chen, 2008) namely green structural capital (GSC), green human capital (GHC) and green relational capital (GRC).

Green human capital described as a combination of all the expertise, abilities, information experiences and capabilities possessing by the individuals working within the organization and they have concern about environment and assist their business organization to operate environmentally(Yusliza et al., 2020). Yadiati (2019) In his study stated that in the presence of green practices in the business organizations then GHC has critical role to achieve the objectives of sustainable performance, In order to promote green relational capital (GRC) and green structure capital (GSC), Green human capital (GHC) must therefore play the most significant role (Sabbir & Taufique, 2022;Chang & Chen, 2013) .

GSC includes organizational policies, databases, strategies, commitment, and capabilities to achieve sustainable organizational performance keeping the intension of green element. This is referred to as the business organizations' intangible non-human assets. (Chen, 2008 ; Yusliza et al., 2020). Green HRM depend on GSC. GSC is essential to implementation of green systems to achieve the sustainable performance of business organizations, therefore organizations focus to build GSC e.g. policies, databases, strategies, commitment, capabilities, philosophies, and green culture for green practices(Garcia-Perez et al., 2020; Agyabeng-Mensah & Tang, 2021).

Last of all GRC, is an interactive relationship of a business with its all-relevant stakeholders. For businesses the relationship and feedback from stakeholders are essential element to achieve sustainable performance. These stakeholders includes competitors, customers and suppliers.(Y. S. Chen, 2008). Every business that wishes to be competitive in the fast-paced market must constantly develop and acquire fresh knowledge. GRC supports the organization's efforts to grow and learn, which results in sustainable (Yusliza et al., 2020).

Hypothesis 1. GIC has a positive relationship with sustainable performance.

2.3-Ambidextrous green innovation and Green Intellectual Capital.

In today's environment, it's crucial for organizations to be ambidextrous to maintain stability and gain a competitive advantage. To build dynamic capabilities and accomplish strategy renewal, this needs for ongoing learning. Organizations may learn new information and abilities owing to ambidexterity, which helps them succeed. Green innovation focuses on providing sustainable innovations in products, services, technology, strategies, and business practices to

support sustainable growth (Rennings, 2000 ; Li et al., 2018).Green ambidextrous innovation define as the capability to incorporate and conform the exploratory and exploitative innovations for sustainable performance (Tushman & O'Reilly III, 1996). In the contemporary age, where sustainability is a significant concern, companies ought to adopt and implement green innovation strategies consistently. These strategies can aid in conserving energy, reducing pollution, and improving environmental quality, all of which contribute to generating value for the company. Green innovation implies to the development and application of newfound and improved output in terms of production, processes, and services that have a favorable effect on the ecosystem. It is essential for companies to incorporate green innovation into their overall business strategy to address the growing environmental concerns.

By developing and executing green innovation strategies, companies can reduce their environmental footprint and enhance their corporate social responsibility. The public is more likely to prefer businesses that emphasize sustainability since consumers are becoming more conscious of the environmental impact of their purchases. Green innovation may also help businesses cut costs and operate more economically. For example, implementing energy-efficient technologies can reduce energy costs and decrease the company's carbon footprint. (Y. Wang et al., 2021).A vital additive to the viewpoint of sustainable performance is green ambidexterity. Numerous companies combine exploitative and exploratory green innovation to accomplish this objective, enabling them to successfully handle environmental issues. Exploitative innovation focuses on enhancing and applying currently available knowledge and technology, whereas exploratory innovation looks for new information, possibilities, and technologies. (Cao et al., 2021).Tushman & O'Reilly III (1996) stated in ambidexterity theory, companies nowadays must maintain a balance between exploitative and experimental operations so as to guarantee steady growth. Exploitative green novelty improves currently green goods, processes, or services by effectively utilizing environmental knowledge, skills, and procedures. (Chen et al., 2014),while exploratory green improvement emphasizes creating novel green markets, goods, services, or processes using innovative eco-friendly data, expertise, and knowledge.

Hypothesis 2. GIC has a positive relationship with ambidextrous green innovation.

2.4- Green Ambidextrous Innovation's mediating effect.

Recently, academics and practitioners together have shown a significant interest in researching the idea of sustainable performance and its related financial, green, and societal considerations. (Asiaeiet al., 2021; Jiao et al., 2022). The need for organizations to enhance their sustainability in order to promote environmental preservation, economic growth, and social advancement is universally acknowledged (Wijethilake, 2017). Sustainable performance is associated with green intellectual capital. (Yusliza et al., 2020 ; Ababneh, 2021). Several GIC components have been theorized to have an impact on SP. GIC understands that upgrading green products and processes is the primary immaterial factor that businesses can use to improve

performance (Yusoff et al., 2019 ; Adesola et al., 2021). Hence, GIC fosters green ambidextrous innovation and encourages a green mindset in all materials and processes, which in turn will probably have an even greater beneficial influence on performance sustainability. As a result, Green Ambidextrous Innovation can act as the link between Performance Sustainability and GIC.

Hypothesis 3. Ambidextrous green innovation has a positive relationship with SP.

Hypothesis 4. Ambidextrous green innovation mediates the relationship between GIC and SP.

2.5- Moderating Role of Environmental strategy:

Past studies have suggested that a business's environmental strategy and proactive measures towards developing eco-friendly knowledges can lead to improved financial benefits (Walker et al., 2014; Fousteris et al., 2018). However, a poor management culture can result in a more reactive environmental strategy, increasing the risk of possible disasters and reputational damage (Zhang et al., 2019b).The natural resource-based approach stresses the value of environmental activities that help businesses achieve sustainability and earn competitive advantages, such as pollution reduction, green purchasing, and sustainability. (Hart, 1995;Stuart Hart & Dowell, 2011). A recent study has suggested that environmental strategies play a crucial role in moderating the role of (CSR) on environmental outcome, as well as their impact on overall performance (Kraus et al., 2020). Given this, we can anticipate that environmental strategies may also moderate the relationship among ambidextrous green innovation (AGI) and sustainable performance (SP). This is because proactive environmental strategies can enhance AGI within an organization, while responsive environmental strategies can have the opposite effect. Therefore, it is essential to understand how environmental strategies moderate the relationship between AGI and SP, as proposed in the following hypothesis. In summary, companies that prioritize developing eco-friendly technologies and implementing proactive environmental strategies may enjoy improved financial outcomes, while those that adopt reactive strategies may face increased risks and damage to their reputation. Additionally, understanding the role of environmental strategies in moderating the relationship between AGI and SP is essential for companies seeking to enhance their sustainable performance.

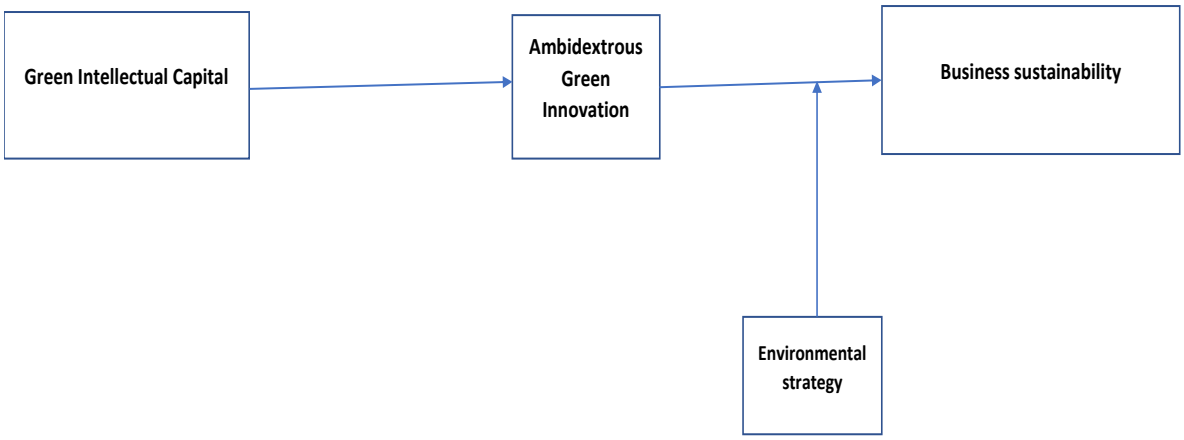
Hypothesis 5. ES moderate the relationship between AGI and SP.

Theoretical Background.

The natural resource based (NRBV) approach serves as the foundation for the following investigation. Which was primarily proposed by (S L Hart, 1995) It was discovered that the resource-based view (RBV) framework introduced by Barney (1991) had limitations, because it was entirely concerned with using and operations of financial, human, and physical resources to establish a viable advantage and boost business performance. In contrast, the Natural Resource-Based View (NRBV) extends the RBV structure by integrating the natural dimension into the company's strategy to gain a viable gain and improve overall firm performance. (Stuart Hart &

Dowell, 2011). And intellectual capital-based view (ICV) theory. According to Haldorai et al.(2022) The Intellectual Capital Value (ICV) theory addresses the dynamic and strategic nature of knowledge capital within business organizations, its significant influence on organizational performance, and its subsequent connection to sustainable performance. To discover the relationships between green intellectual capital (GIC), ambidextrous green innovation, environmental strategy, and sustainable business performance, this study will use the Natural Resource-Based View (NRBV) framework and the Intellectual Capital Value (ICV) theory.

Figure No 1: Theoretical Framework.



3- Methodology

3.1- Sampling design and data collection.

In Lahore, Karachi, and Islamabad—three heavily populated cities in Pakistan. Hotels with varied star ratings (three, four, and five stars) provided data for this study. These cities were chosen because hotels there are subject to severe laws under the Pakistan hotels and Restaurants Act 1976. In Punjab, Punjab food authority carefully supervises, regulated these hotels, and imposes severe fines for infractions of the set standards. Around 500 management personnel were the study's target group, who worked at 40 hotels.320 responses received, and 298 responses qualified for the final analysis. A scale of the constructs has been adopted from previous studies (Laosirihongthong et al., 2013; Zhu et al., 2008; Paulraj, 2011; Chen, 2008; Chen et al., 2014 and Janet al., 2009). Respondents were asked the degree of their agreement with the 16 items of performance sustainability (5 questions of environmental performance, 5 questions of economic performance and 6 questions of social performance), 19 items of green intellectual capital (5 items of green human capital, 9 items of green structural capital and 5items of green relational capital), 8 items of Green Ambidexterity Innovation and 3 items of environmental strategy. Proposed model tested using a method known as partial least squares. Using Smart PLS, the structural and measurement model was developed

(3.2.9). For this, a convenience sampling strategy was used. The data was collected from November 2022 to February 2023. The Partial Least Squares method has been most appropriate for applying the power analysis technique. Structural Equation Modelling literature to determine effective sample size (Hair et al., 2017). The study's objective was communicated to the relevant hotel authorities through a written introduction and approval letter, and after obtaining formal approval, data was collected through a personally administered survey method that was deemed acceptable. Hotel managers were notified of the survey's purpose and guaranteed the confidentiality and anonymity of the information, which allowed them to willingly participate in the self-administered survey and provide responses to the questions. The respondents were also informed of the survey's objectives.

3.2. Demographic Profile of Samples

In this section of the study, demographic information gathered from the survey is analyzed using descriptive statistics such as distribution of frequencies, percentile descriptions, cumulative percentages, means, SD, and skewness. Gender, age, education, and kind of job are among the demographic factors considered in this research. The tables below reflect the findings of this investigation.

Table No 1: Demographics

Demographic Variables	Categories	Frequency	Percent
Gender	Male	149	50.0
	Female	149	50.0
Age	Up to 25	173	57.9
	26 to 45	62	20.7
	46 to 55	27	9.4
	Above 55	36	12.0
Education	Bachelor's	43	14.4
	Master's	202	67.6
	PhD	42	14.4
	Others	11	3.7
Nature of Employment	Contractual	85	14.4
	Permanent	175	58.9
	Others	38	12.7

Table 1 displays the demographic data on respondent gender in terms of frequency distribution, percentage, and cumulative percentage. It reveals that out of 298 respondents, 50.0% (149) were male and 50.0% (149) were female. Additionally, the table indicates the distribution of

respondents based on age, with 57.9% (173) of survey participants being 25 years old or younger. furthermore, the data shows that 20.7% (62) of respondents fell in the age range of 26 to 45 years old, 9.4% (27) were amongst the ages of 46 and 55, and 12% (36) were older than 55 years old. These findings suggest that a significant proportion of the survey respondents were in the age bracket of 25 years or younger. he results reveal the educational level of the survey participants. Table 1 shows that 14.4% (43) of the respondents had a bachelor's degree , 67.6% (202) held a Master's degree, and 14.4% (42) held a PhD degree. According to the data, most of the participants held bachelor's degrees.

Table No 2: Descriptive Statistics of All Variables (N = 298)

Variables	Mean	S. D	Skewness	Kurtosis
GIC	3.90	0.681	-0.410	-0.895
GAI	3.83	0.699	-0.276	0.378
ES	3.73	0.960	-0.406	-0.545
SP	3.82	0.651	-0.184	-0.684

Table 2 provides the values of mean and standard deviations for the research variables as well as other descriptive date. The skewness and kurtosis values for all variables fall within an acceptable range. Specifically, the mean values for Green intellectual capital, Green ambidextrous innovation, Environmental strategy, and sustainability are 3.90, 3.83, 3.73, and 3.82, respectively. Normality was assessed using skewness and kurtosis. Table 2 provides a clear summary of these statistics. (Munro, 2005). The normal distribution of all constructs was confirmed as the skewness and kurtosis values for each variable fell within an acceptable range of -2 to +2. A skewness and kurtosis value between -2 to +2 indicates a relatively normal distribution, and therefore, the scores for all constructs can be considered normally distributed.

4. Data Analysis.

4.1. Measurement Model

To test the hypotheses, PLS-SEM was utilized as it is commonly used in all business sectors and eliminates the need for normal data distribution assumptions. Moreover, to determine the significance levels of loadings, weights, and path coefficients, bootstrapping is widely employed in PLS analysis as no distributional assumptions are necessary. The bootstrapping method involves resampling the data to estimate sampling distributions, calculate standard errors, and determine confidence intervals for parameter estimates.

To assess internal consistency CFA was used. Thus, bootstrapping method was used in the PLS analysis to evaluate the loadings, weights, and path coefficients' statistical significance (Hair

et al., 2017). Table 3 displays the results, which indicate that each variable has (a) "Cronbach's α value more than 0.70" (b) "an average variance extracted (AVE) than 0.50", (c) "composite reliability greater than 0.70". These findings suggest that the measurement models satisfy the rule of thumb evaluation criteria, as proposed in the related literature (Hair Jr et al., 2021). The significant convergent validity findings show the validity and reliability of all items pertaining to the model's components and the use of Heterotrait-Monotrait (HTMT) ratio to assess discriminant validity or divergent validity of the latent variables in the model. The HTMT ratio is a newer approach in PLS-PM methodology and is superior to Fornell-Larcker's criterion for assessing discriminant validity.

According to Henseler et al. (2015) based on the recommended rule of thumb, the HTMT value below 0.90 presented in Table 3.2 is indicative of satisfactory results. This implies that the model's latent variables' discriminant validity or divergent validity is acceptable (Hair et al., 2017).The Fornell-Larcker criteria findings are shown in Table 3.1, and they are also used to validate the discriminant validity of the model's latent variables. The Fornell-Larcker criteria is tested by comparing the square root of the AVE for each construct to the correlations between that construct and other constructs in the model. If the square root of the AVE is greater than the correlation coefficients between the concept and constructs, discriminant validity is proven.
The findings from Table 3.1 may also support the discriminant validity of the latent variables in the model.

Table No 3: Convergent Validity

Construct	Items	loadings	Alpha	CR	AVE
GIC	GIC1	0.708	0.946	0.950	0.503
	GIC10	0.642			
	GIC11	0.674			
	GIC12	0.652			
	GIC13	0.702			
	GIC14	0.720			
	GIC15	0.717			
	GIC16	0.690			
	GIC17	0.717			
	GIC18	0.778			
	GIC19	0.771			
	GIC2	0.689			
	GIC3	0.715			
	GIC4	0.768			
	GIC5	0.772			
	GIC6	0.705			
	GIC7	0.705			
	GIC8	0.645			

	GIC9	0.683			
GAI	GA1	0.775	0.908	0.927	0.614
	GA2	0.760			
	GA3	0.835			
	GA4	0.798			
	GA5	0.875			
	GA6	0.798			
	GA7	0.808			
	GA8	0.591			
ES	ES1	0.930	0.922	0.950	0.865
	ES2	0.938			
	ES3	0.921			
SP	SP1	0.517	0.924	0.935	0.509
	Sp10	0.564			
	SP11	0.747			
	SP12	0.747			
	SP14	0.748			
	SP15	0.753			
	SP2	0.707			
	SP3	0.790			
	SP4	0.797			
	SP5	0.810			
	SP6	0.795			
	SP7	0.658			
	SP8	0.653			
	SP9	0.626			

4.2 Correlations and discriminant validity results

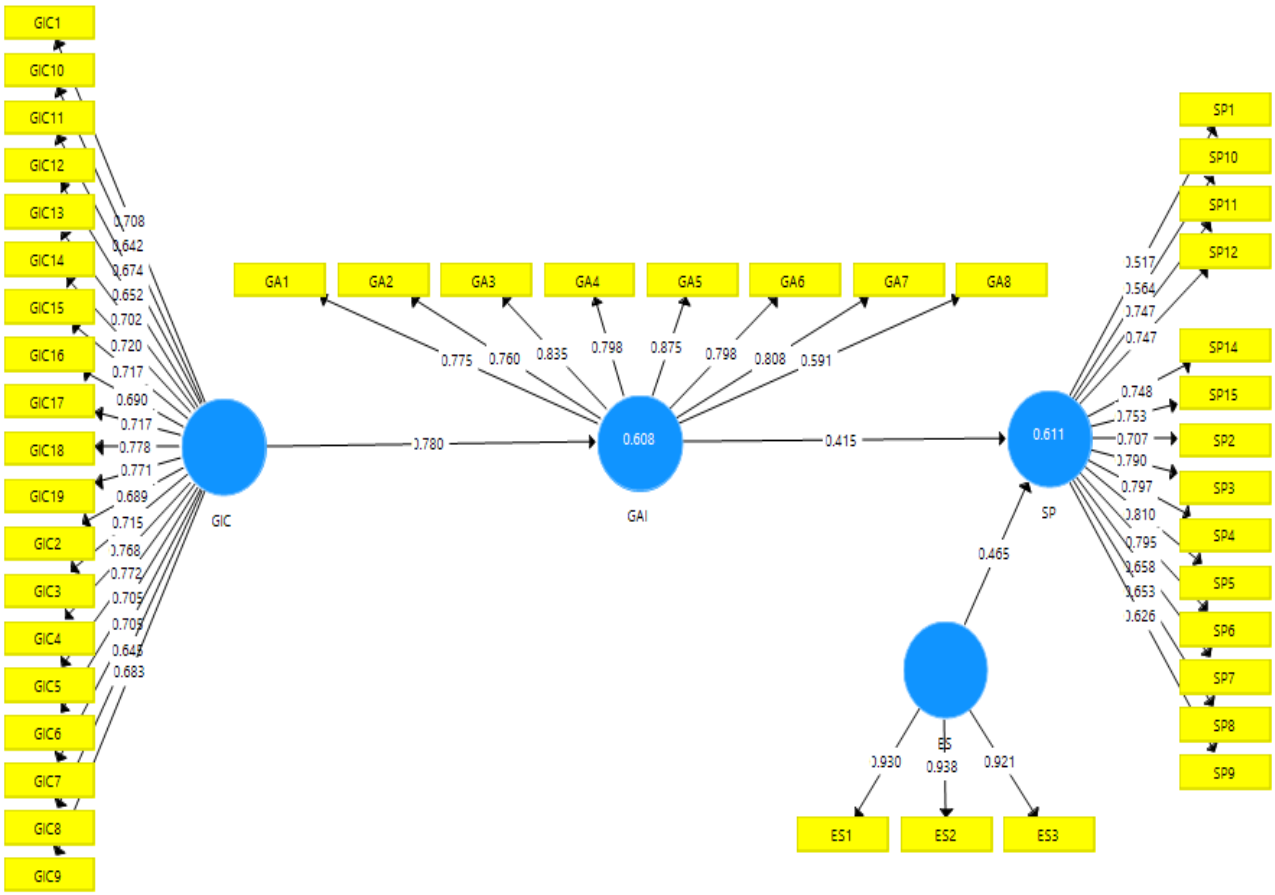
Table No 3.1; Fornell Larcker Criterion

ES	GAI	GIC	SP
0.930			
0.579	**0.784**		
0.479	0.780	**0.709**	
0.705	0.683	0.622	**0.720**

Table No 3.2: HTMT Ratio

	ES	GAI	GIC	SP
ES				
GAI	0.634			
GIC	0.507	0.807		
SP	0.743	0.742	0.663	

Figure No 2: Mediation Analysis



4.3 Results and Hypotheses testing. (SEM)

In the first phase wo found that all the variables and indicators were accurate. In the second phase evaluate the results about structure model and test the hypothesis. In PLS, the interpretation of path coefficients is equivalent to standardization of regression coefficients because the PLS algorithm uses an iterative approach to analyze multiple regression series. The variance inflation factor (VIF), predictive relevance Q2, and r-square are similar concepts employed to calculate the predictive power of the model. VIF indicates the degree of multicollinearity with the predictor variables in the model, while Q2 measures the predictive accuracy of the model. R-square, on the other hand, measures the amount of variance in the dependent variable clarified by the independent variables in the model.(Hair et al., 2017). The recommended values for VIF are ≤3.3 or ≤5. (Hair et al., 2017). As per findings in Table 4, collinearity had no effect on the conclusions of our investigation. The prediction ability of our model was assessed in addition to collinearity by looking at the determination coefficient (R2) and Q2. R2 values of 0.608 for green ambidexterity and 0.616 for sustainable performance are demonstrated in the results in Table 4.Q2 was evaluated which predicts the accuracy of R2. In our findings Q2 ≥ 0 which signifies the predictive power of model.

Also, the standardized root mean squared residual was used to evaluate the model's goodness of fit indices (SRMR). SRMR was measured at 0.122, which is less than 1.0. This suggests that the inferred model and the observed correlation are not significantly at odds. Direct hypotheses. Structure model results.

Table No 4: Coefficient of Determination

	R Square	Effect Size	Q^2	VIF	SRMR
Green Ambidexterity Innovation	0.608	Substantial	0.368	1.543	
Sustainable performance	0.616	Substantial	0.302		0.122
Environmental strategy		1.507			
Green intellectual capital				1.000	

4.4 Direct Hypotheses

Direct hypotheses were investigated using a bootstrapping approach with a 95% bias-corrected confidence interval before examining intervening and moderating effects. The findings, as displayed in Table 4.2, reveal that the importance of the effect of GIC on sustainable performance support H1 the coefficient value (β = 0.312, p = 0.000). Also, the coefficient value (= 0.780, p = 0.000) for the relationship between green intellectual capital and green ambidexterity was found to be positively significant, supporting Hypothesis 2.). The analysis showed that the effect of green ambidexterity on sustainable performance is significant (β = 0.400, p = 0.000), confirming Hypothesis 3. This implies that hotels that can implement both exploratory and exploitative innovations, along with green intellectual capital, are more sustainable. The findings

are consistent with the assumption that green innovations in goods, services, or procedures can improve sustainability as well as the notion that green ambidexterity innovation directly affects sustainability.

Table No 4.1 Effect Size

	F2	Effect	F2	Effect
	GAI		SP	
ES	-		0.366	Large
GAI	-		0.270	Medium
GIC	1.552	Large	-	-
SP			-	-

Table No 4.2: Results of Direct Relationship. Path analysis

	Relationship	Beta	SD	t	P	LL	UL	Decision
H1	GIC-> SP	0.312	0.044	7.060	0.000	0.237	0.385	Supported
H3	GAI-> SP	0.400	0.053	7.556	0.000	0.315	0.484	Supported
H2	GIC-> GAI	0.780	0.023	33.92	0.000	0.740	0.814	Supported

4.5 Mediation

Our research's current phase focuses on the variable green ambidexterity innovation's mediating impacts on the relationship between green intellectual capital and sustainable performance, and its goal is to support Hypothesis 4. The findings of the mediation study are showed in Table 4.3. As the variable green ambidexterity significantly mediates the relationship between GIC and sustainable performance, with a value of = 0.312, Hypothesis 4 may be supported. It has been seen how green intellectual capital directly impacts sustainable performance. One may argue that green ambidexterity innovation totally mediates the relationship.

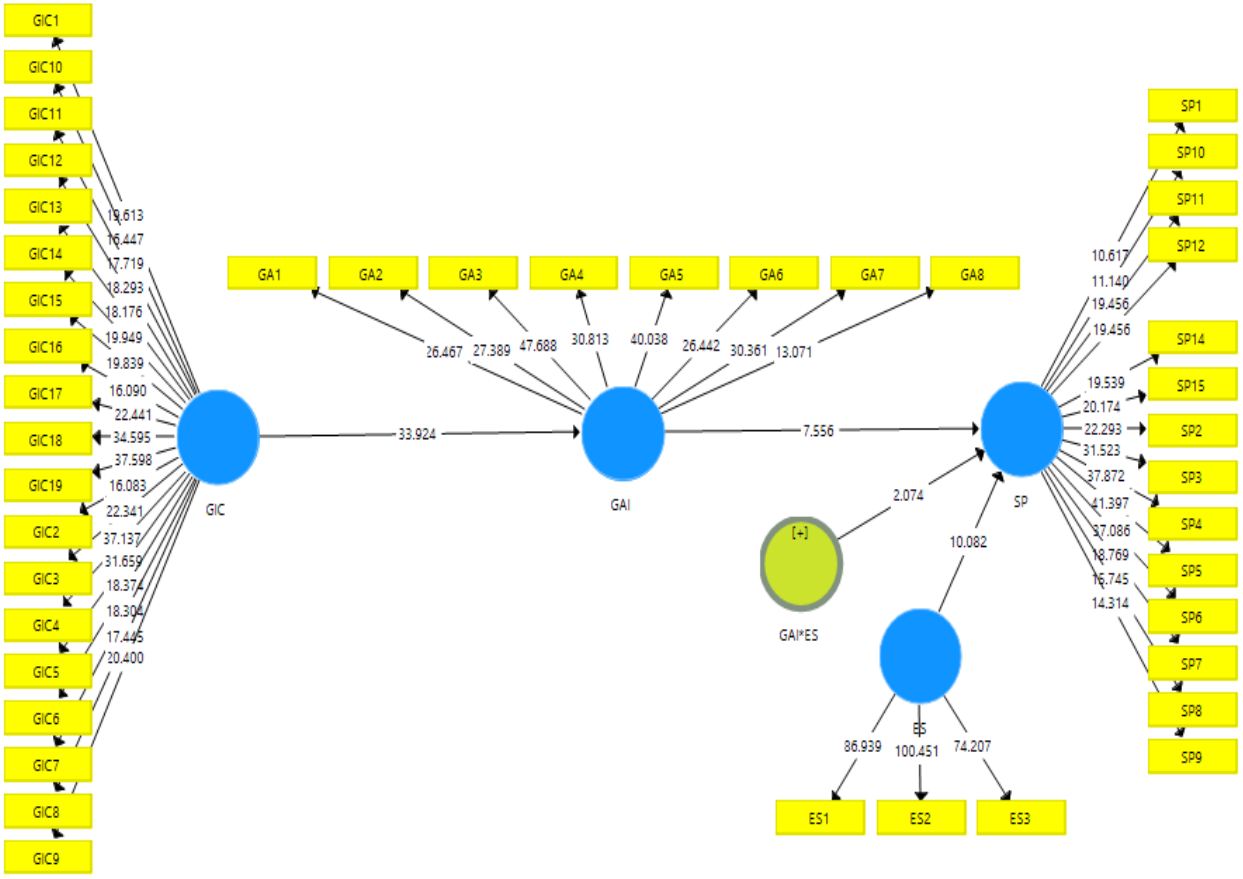
4.6 Moderation.

At this stage, the focus of our study is on the moderating impact of the variable environmental strategy on the connection between green ambidextrous innovation and sustainable performance. Table 4.3 shows the hypotheses testing regarding the moderating role of ES. According to Table 4.3, the link between green ambidextrous innovation and sustainability was influenced by the presence of an environmental strategy (ES), as shown by the significant interaction term GAI*ES. However, the direction of this influence was negative, as indicated by the beta coefficient of -0.063, t-value of 1.745, and the confidence interval between -0.122 and -0.004. Therefore, hypothesis H5 was supported in a negative manner, suggesting that the environmental strategy in our study weakened the relationship between green ambidextrous innovation and sustainable performance.

Table No 4.3: Indirect Effects. Mediating and moderating effect

	Relationship	Beta	SD	T	P	LL	UL	Decision
H4	GIC-> GAI-> SP	0.312	0.045	7.004	0.000	0.242	0.388	Supported
H5	GAI*ES -> SP	-0.063	0.036	1.745	0.041	-0.122	-0.004	Supported

Figure No 3: Moderation Analysis



5. Conclusion

The main objective of this study was to investigate how green intellectual capital impacts the accomplishment of sustainable performance along with the mediating significance of ambidextrous innovation and the moderating influence of environmental strategy. Data was gathered from 298 hotel employees in three cities of Pakistan through convenience sampling. The measurement and structure models have been analyzed using Smart PLS 3-SEM. Additionally, SPSS was used for demographic and descriptive analysis of the collected data.

In our study we provide five hypotheses. It's worth noting that our study demonstrates the following results. The implementation of green innovations is crucially facilitated by GIC, which supports green ambidexterity, according to this. Hotels should thus give Green Innovation adoption top priority to promote green ambidexterity. The study also offers actual data in favor of the connection between green ambidexterity and sustainable performance. The first hypothesis Applying statistical research, which demonstrated a strong association between the GIC and SP. Hypothesis (H1) claiming that green intellectual capital (GIC) has a considerable positive influence on sustainable performance (SP) was proven. GIC is an unseen, intangible resource that may provide you with an edge over your competitors. This conclusion is reinforced by (Chaudhry & Khan, 2016), who discovered that having informed and competent employees, a favorable company culture, and effective management that develops strong relationships with stakeholders allows businesses to maintain sustainable success. The results of (Yusoff et al., 2019) , who confirmed the favorable influence of GIC on sustainable performance in hotels beyond these norms, further support this conclusion. This shows the need to take advantage of green initiatives to a greater direction by implementing a thorough environmental management system, which includes GIC, to help businesses sustainably (Obeidat et al., 2023). However, the second hypothesis (H2) established a substantial link between green ambidexterity innovation and green intellectual capital. The findings imply that because GIC directly supports GAI and has a positive impact on it, hotels with greater levels of GIC are more likely to adopt GAI. This result is in line with research by Ali et al. (2021), Research discovered that businesses in Pakistan with higher levels of GIC are more likely to adopt green operating practices. This shows that increasing green resource concentrations, such as green human, structural, and relational, capitals are essential for supporting ambidextrous green innovation inside the organization. These are in line with contemporary innovation research that focuses how resource orchestration might encourage businesses to pursue exploitative and exploratory green innovation (Wang et al., 2020).

The third hypothesis (H3) suggests that green ambidextrous innovation (GAI) has a positive impact on sustainable performance (SP). The result is consistent with current trends that focus on the importance of shaping the relationship between environmental activities, strategies, or resources (such as GIC) and sustainable performance, rather than directly linking them. To effectively manage and coordinate an organization's green intellectual assets, as well as to promote green innovation and improve overall performance. A positive association between ambidextrous green innovation and business performance is also shown by the data. This outcome is consistent with earlier research such as ((Lee et al., 2018 & Úbeda-García et al., 2022). Greater GIC investments encourages employees to get involved in exploitative GAI, particularly in developing nations like Pakistan where scarce resources exist.

The fourth hypothesis (H4) of the study, which proposes that GAI acts as an intervener between GIC and SP, is supported by the results. This means that GIC has an indirect impact on SP by strengthening GAI. In other words, if hotels want to improve their SP, they should prioritize GIC to enhance GAI. This finding aligns with earlier research that found GI to be a key factor in

maximizing the beneficial impact of GIC on SP. (Tjahjadi et al., 2022; Waqas et al., 2021 and Syafri et al., 2021)

The fifth hypothesis, H5, claims that the link between green ambidextrous innovation (GAI) and sustainable performance is moderated by environmental strategy (ES). The study discovered that the GAI and ES interaction term was significant, but the direction was negative. Although it suggests that environmental strategy has a substantial effect but reduces the relationship between GAI and sustainable performance. Contrary to the conclusion of (Rehman et al., 2021b) that environmental strategy positively modifies the association between green innovation and performance. Several variables can mediate and moderate the relation between a proactive environmental strategy and environmental performance (Zhang et al., 2019a). extending the scope of this earlier study of the role of proactive environmental approaches that might include sustainable development, pollution reduction, and product stewardship (Stuart L. Hart & Dowell, 2011 ;S L Hart, 1995).An environmental strategy may be beneficial for green innovation and sustainable performance but current study shows that in hotel industry in Pakistan it may reduce the impact of green ambidextrous innovation on sustainable performance.

5.1 Theoretical and Managerial Implications.

The findings have a wide range of profound theoretical and management ramifications. By examining the interaction between GIC and SP through mediating GAI and regulating CSR between GAI and SP, they have added to the body of knowledge. To optimize the effect of GIC on SP in Pakistan's hotel business, this link must be researched. The findings demonstrated that GIC could only expand when a company actively participated in GAI. Moreover, GIC and GAI on SP have a connection with one another. As a result, the mediation of GAI in this connection points to the need for a thorough framework to investigate how GAI affects SP. Numerous environmental challenges confront most hotels. As a result, this study presents an opportunity for researchers to conduct research in other sectors beyond the hotel industry and compare their findings with those of this study.

According to the findings, GIC plays a crucial role in developing GAI and driving SP. GIC is an intangible resource that evolves through interaction with GAI and contributes to achieving SP. Therefore, hotels must prioritize enhancing their employees' knowledge, expertise, understanding, vision, commitment, and skills in environmental safety. This can be achieved through training programs that address environmental issues. Additionally, hotels should provide their employees with opportunities to apply what they have learned during the training, which can improve their skills and abilities, leading to stronger GAI and ultimately promoting SP.

. Firstly, for a company to compete with its rivals by creating green processes, goods, and services, green intellectual capital is critical for the recruiting, training, and retention of workers who bring green values and beliefs to the workplace. Yet, our research indicates that Pakistani hotels frequently prioritize teaching environmental awareness to their employees, which is insufficient to spur green ambidexterity through GIC. To fully utilize GIC for encouraging green ambidexterity and achieving sustainable performance, managers should increase their use of green

human resource management techniques, including training, recruitment, selection, performance evaluation, compensation, and employee participation policies. Second, Businesses should invest heavily into GIC and treat it as a strategic asset for directing human talent towards management tasks. To encourage and sustain green process and product innovation, top management should seek to integrate performance goals with green intellectual capital. Additionally, hotel managers must put more effort into evaluating and overseeing staff members' sustainable performance and activities (for example, by creating an independent board to watch over staff members' daily work and environmental, social, and economic activities, or by giving staff members feedback from customers, managers, and supervisors. To encourage and maintain green process and product innovation, businesses should invest significantly in GIC and treat it as a strategic asset to direct human talent towards management tasks. Our study shows that top management should integrate performance goals with GIC through exploration and exploitation. GIC can help hotel management enhance staff members' pro-environmental behavior, and employees should receive training on identifying and reducing waste, emissions, and resource consumption. The evaluation and supervision of staff members' sustainable performance and activities should also receive more attention from hotel managers. One way to do this is to establish an impartial board to oversee daily operations as well as environmental, social, and economic activities, or to solicit feedback from guests, managers, and supervisors.

5.2 Limitations and Future Directions.

There are several limitations on the current study that must be recognized. The data were only gathered once, it is difficult to draw conclusions about causes. To prove causation and investigate the link between GIC, green ambidexterity, and sustainable performance over time, future research should think about employing a longitudinal approach. Second, although the study concentrated on the mediating function of green ambidexterity, it is possible that other factors might also attenuate this association. Future studies may look into how market competitiveness, organizational culture, leadership styles affect the link between GIC and sustainable performance. Finally, just one industry and one region were studied so the results cannot be applied across the board. To strengthen its external validity, future research should try to replicate and expand upon these findings in various situations and sectors. The sample size was also quite small, which might have reduced the studies' statistical power. Larger samples may be used in subsequent research to improve the reliability and generalizability of the results.

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