Australian Journal of Business and Management Research
New South Wales Research Centre Australia (NSWRCA)

Volume. 8, Issue. 2, (66-78) ISSN (Online): 1839 - 0846

Green Organizational Culture and Firm's Environmental Performance: Assessing the role of Green Innovation, Environmental Management Accounting and Environmental Strategy

Qingmei Tan[1], Kamran Ali [2], Muhammad Abubakar Tahir[3] and Muhammad Haroon Rasheed[4]

Received: 10 May, 2024
Final Revision: 16 October, 2024
Accepted: 30 October, 2024
Published: 27 November 2024
10.52283/NSWRCA.AJBMR.20240802A06

Abstract

Firms are increasingly focusing on competitiveness and sustainability by reducing environmental costs and achieving sustainable development. This study is to scrutinize the impact of green organizational culture on green innovation, environmental management accounting and environmental strategy, and their impact on environmental performance. This Study employed a quantitative research approach to empirically test the theoretical model of the study. Data were collected from a sample of 253 respondents in Pakistani manufacturing firms and analyzed using Smart-PLS 4. The findings reveal that green organizational culture significantly predicts environmental management accounting, environmental strategy, and, subsequently, environmental performance. However, green innovation does not significantly affect environmental performance. Moreover, environmental management accounting and environmental strategy play significant mediating roles in these associations, while green innovation emerges as an insignificant mediator. These empirical insights contribute to the Natural Resource-Based View literature and offer practical recommendations for improving environmental performance, thereby advancing sustainable goals, particularly with regard to environmental concerns

Keywords: Green Organizational Culture, Green Innovation, Environmental Management Accounting, Environmental Strategy, Environmental Performance.

I. Introduction

Environmental Performance (EP) is an increasing concern for many global stakeholders, including governments, corporations, lawmakers, and consumers (Solovida & Latan, 2017), since the environment is seen as being threatened by climatic change, it is necessary to take steps for the mitigation of climate change, such as reducing greenhouse gas emissions (Anthony Jr, 2019). The environmental impact of organizational activities and organizations is referred to as "Environmental Performance" and firms can enhance their environmental performance by incorporating recycled materials into their products, adopting clean production methods, and

[1] College of Economics and Management, Nanjing University of Aeronautics and Astronautics, Nanjing, China
tanchangchina@sina.com (Supervisor)
https://orcid.org/0000-0002-2156-5006

[2] College of Economics and Management, Nanjing University of Aeronautics and Astronautics, Nanjing, China
kamran.ali@pugc.edu.pk (Corresponding Author)
https://orcid.org/0000-0003-4149-6893

[3] College of Economics and Management, Nanjing University of Aeronautics and Astronautics, Nanjing, China
mabubakar@nuaa.edu.cn
https://orcid.org/0009-0005-5588-9411

[4]Department of College of Economics and Management Nanjing University of Aeronautics and Astronautics Nanjing, P.R. China.
haroon.rasheed@nuaa.edu.cn
https://orcid.org/0000-0001-7951-6867

implementing eco-friendly administrative and operational practices. This leads to a reduction in environmentally harmful waste and emissions of pollutants and waste materials (Solovida & Latan, 2017; Shah & Soomro, 2021; Wang et al., 2021). Research indicates that when a company embraces environmental values as part of its culture, it can achieve greater success and outperform its competitors. This is because such values contribute intangible benefits, giving these organizations a competitive edge through effective use of environmentally friendly resources and practices (Gürlek & Tuna, 2018; Leal-Rodríguez et al., 2018). Therefore, establishing a green organizational culture is important for EP.

Interestingly, there are currently just a few published studies on green organizational culture (GOC), despite it being a reasonably important research topic in the corporate world. The term's definition is therefore somewhat ambiguous. The concept of GOC (Gürlek & Tuna, 2018), can be easily adapted and inferred from earlier organizational culture literature. According to Schein, (1992), organizational culture is a group of shared values, beliefs, attitudes, and mental presumptions that help members of an organization decide if their actions and behavior are appropriate in various situations. The values, tenets, and beliefs that direct an organization's behavior and operations in the face of environmental concerns can be referred to as GOC in the context of the natural world (Imran, Arshad, & Ismail, 2021; Imran & Jingzu, 2022).

Environmental Management Accounting (EMA) tools give businesses a beneficial method for guiding decision-making by emphasizing how stakeholders should be integrated into environmental effectiveness (Saeidi et al., 2018; Christine et al., 2019). Furthermore, Innovation not only ensures superior long-term performance of the organization, but in the form of green innovation (GI) promotes environmental commitment by compliance with environmental-oriented actions (Imran & Jingzu, 2022; Aftab et al., 2023). According to (Latan et al., 2018; Kraus, Rehman, & García, 2020), to achieve the organization's environmental objectives, modern researchers and industrial practitioners concentrate on building appropriate environmental strategy (ES), which includes cutting-edge preventive practices and eco-efficient practices). According to (Fousteris et al., 2018), ES is positively correlated with financial performance of a firm, while a proactive environmental strategy is seen as an important aspect in assessing the environmental performance of organizations (Solovida & Latan, 2017; Shah & Soomro, 2021). Hence, this study analyzes how these factors, such as GOC, GI, EMA and ES work together to achieve higher EP.

Only a few research have demonstrated that incorporating GOC in firms significantly improves their organizational performance (Wang, 2019). Researchers continue to focus on this issue although numerous studies have found a correlation between GOC and an organization's success due to the paucity of definitive data. The study found no proven link between an organization's GOC and its performance in terms of environment (Imran & Jingzu, 2022). Additionally, many researchers suggested using moderators or mediators between GOC and performance notwithstanding the findings of past studies (Tahir et al., 2019; Imran & Jingzu, 2022). Furthermore, studies have shown the importance of green innovation for long-term success (Küçükoğlu & Pınar, 2016; Imran et al., 2021). Unfortunately, the researchers gave little consideration to green innovation when evaluating EP (Imran et al., 2021), making it an obvious gap in the literature.

Additionally, the studies on how EMA interacts with EP and FP in firms operating in South Asia are limited (Deb, Rahman, & Rahman, 2022). Although several studies linking EMA and EP have been found, they have all been centered on developed nations (Liu, Wang, & Li, 2018; Alaeddin, 2019; Christine, 2019; Mayndarto & Murwaningsari, 2021). Furthermore, according to (Niu et al. 2017; Ong et al. 2019), the association between EP and FP needs to be demonstrated. A study by (Deb et al., 2022) has urged future scholars to conduct more research to identify the mediating and moderating relationships between EMA and EP (Amir, Malik, & Ali, 2024; Malik et al., 2024). Despite the importance of ES, as determined by previous scholars, little study has been done to evaluate environmental performance using environmental strategy. Thus, this study is motivated to fill these knowledge gaps by investigating the direct and indirect effects of GOC on the environmental performance of manufacturing firms in Pakistan. The study specifically tests for the mediating effects of GI, EMA, and ES in the relationship between GOC and EP.

By providing novel insights and knowledge into a topic considered crucial for enhancing corporate performance, this study's combination of research findings significantly contributes to our theoretical and practical understanding. The study presents an original, innovative perspective using robust statistical measures on GOC, GI, EMA, ES, and EP. Consequently, the hypotheses play a pivotal role in determining the relationship between GOC and EP through their direct and indirect associations with mediators such as GI, EMA, and ES, thereby establishing underlying mechanism effects. This research extends the NRBV by examining the link between GOC and EP specifically within Pakistan's manufacturing sector. The study's findings have implications for scholars, practitioners, managers, and industrial policymakers. It aims to provide guidance for small, medium, and large

manufacturing firms regarding the development of an effective green organizational culture and its influence on ES, GI, and EMA on EP, as contemporary general managers and policymakers prioritize enhancing environmental performance due to increasing environmental concerns. The findings are especially beneficial for the manufacturing and other industries in emerging economies to enforce appropriate environmental strategies to reduce waste, pollution, and air emissions, and conserve water and energy, meanwhile working on innovation and adopting the EMA tools that lead to enhancing environmental performance.

II. Literature Review and Hypotheses Development

The upcoming sections will expound upon the Natural Resource-Based View theory as the theoretical framework for this study and introduce the hypotheses derived from a thorough review of existing literature.

Underpinning theory

This research uses the Natural Resource Based View to fulfill the research objectives, which is an extension of the RBV theory. According to it, organizational competencies and resources play a crucial role in achieving a competitive advantage (Barney, 1991; Barney, Wright, & Ketchen Jr, 2001). Additionally, NRBV theory is an expanded version of the same that contends businesses can acquire a consistent competitive advantage by addressing challenges related to the natural environment. According to (Hart, 1995), RBV theory leaves several things out. The relationship between the organizational natural environment and the organization itself is excluded. This absence was once reasonable, but it is now abundantly clear that the environment plays a role in gaining a competitive edge. Natural resources and technological advancements increase profitability from pollution reduction. They understood that organizational capabilities and strategies all improve sustainable performance (Hart & Dowell, 2011). Therefore, this theory is utilized to analyze and measure firms' environmental performance by focusing on green organizational culture, green innovation, EMA, and environmental strategy.

Green Organizational Culture

Green organizational culture emphasizes an organization's unwavering commitment to working on environmental challenges, regardless of how challenging the situation may appear to be. Different names are used to describe green organizational cultures, such as pro-environmental culture, sustainability culture, green consciousness, and eco-friendly culture (Imran et al., 2021; Imran & Jingzu, 2022). As per Roscoe et al. (2019), an organization's employees are considered to have a "green" culture when their thoughts and actions extend beyond purely economic considerations. Instead, they focus on maximizing the positive impacts of the organization's operations while simultaneously minimizing any adverse effects on the environment (Ali, Amir, & Malik, 2023). This could lead to firms performing in innovative ways, formulating and enforcing efficient environmental strategies, and adopting effectively the EMA (Zandi & Lee, 2019; Aftab et al., 2023). This confirms that manufacturing companies with a strong green culture are pushed and encouraged to follow these sound business practices. As a result, green culture has been shown to influence organizational members' behavior according to its goals and attitude and hence contribute to better environmental performance (Chang & Lin, 2015). Using these findings, we posit that GOC can have a significant influence on EP, GI, and ES, hence deducing the hypotheses as follows:

H1: Green organizational culture significantly impacts EMA.
H2: Green organizational culture significantly impacts environmental strategy.
H3: Green organizational culture significantly impacts green innovation.

Green Innovation

According to Ferreira et al. (2010), green process and green product innovations are the two ways to define "green innovation." According to (Saeidi et al., 2018), the development of greener products and production methods is positively connected with the competitive advantage of manufacturing firms. Core competencies are the ability of an organization as a whole to use innovation to create environmentally friendly products and procedures. Core competencies were later proposed by (Somjai, 2020), who demonstrated that the quantity of green innovation projects undertaken by a firm is related to its green core competencies. Green innovation enhances a company's total competitiveness and green reputation, which improves the performance of the entire firm (Saeidi et al., 2018). Designing goods, processes, technologies, and practices that affect energy efficiency are just a few examples of how green innovation can be applied. As a result, green innovation has evolved into a strategic tool for promoting environmental preservation and achieving long standing sustainability in the manufacturing sector (Fernando &

Wah, 2017). Studies highlight a direct and indirect, yet significant association of GI with the firm's performance (Kraus et al., 2020; Imran et al., 2021; Imran & Jingzu, 2022). Based on this, the following hypothesis is proposed:

H4: Green Innovation is significantly impacting environmental performance.

Environment Management Accounting

Deb et al. (2022) define EMA as the creation and application of appropriate sustainability reporting systems and practices. EMA differs from other traditional accounting methods in identifying these differences because it takes environmental concerns into account when analyzing environmental data in the accounts, measuring ecological data to prevent resource and energy waste, and evaluating environmental information. According to Solovida and Latan, (2017), EMA implementation can reduce the expense of environmental regulation while also improving the company's reputation for environmental care. EMA focuses on environmental data that affects the environment, improves an enterprise's sustainability performance, and helps create novel solutions (Deb et al., 2022). In previous studies, researchers have examined the relationship between EMA and other factors, such as cost advantage (Christine, 2019), CSR (Hadj, 2020; Ingrao et al., 2018), institutional pressures, environmental strategy, and organizational performance (Omran et al., 2021), financial performance (Huang & Li, 2017), and environmental performance (Mansoor et al., 2021), and found positive associations. According to Deb et al. (2022) and Latan et al. (2018), by adopting EMA, firms can reduce expenses, which assists them in improving both their financial and environmental performance. Similar findings between EMA and environmental performance were found in studies by (Phan, Baird, & Su, 2018; Zandi & Lee, 2019). Hence, we conclude that EMA actively contributes to environmental performance, and the following hypothesis is made:

H5: EMA is significantly impacting environmental performance.

Environmental Strategy

To minimize its impact on the environment, operations, and production, an organization plans and implements many initiatives and actions known as "Environmental Strategy" (Albino, Balice, & Dangelico, 2009). These strategies are put into practice through programs, policies, and procedures, which improve product development and innovation. Through the use of green organizational resources, such as sustainable energy sources and effective EMA, ES also aids in reducing energy consumption and waste products, increasing the profits of the firm (Aftab et al., 2023). This indicates that increasing environmental concerns and outside forces have forced organizations to create and implement efficient ES. According to Rodrigue et al. (2013), organizations with rigorous ES typically have superior Environmental performance. Furthermore, (Solovida & Latan, 2017) research shows that businesses, that develop and enforce effective ES, usually outperform their counterparts in terms of achieving environmental goals. ES ensures that environmental programs are carried out to achieve sustainable firm performance by integrating ecological considerations into an organization's operational plans (Kraus et al., 2020). Studies indicate that ES has a significant impact on Environmental Performance (Latan et al., 2018; Christine et al., 2019; Kraus et al., 2020), and hence, using these findings, we contribute to the following hypothesis:

H6: Environmental Strategy impact environmental performance.

Mediation of Green Innovation

Scholars argue that developing a green organizational culture entails setting clear objectives, recognizing the relevant personality traits among employees, and showcasing artifacts that align with the organization's goals and desires for ecologically sustainable operations (Tahir et al., 2019; Imran & Jingzu, 2022). According to (Scholz & Voracek, 2016), businesses can significantly enhance their environmental performance by cultivating a green organizational culture within their institutions. Furthermore, this underscores the importance of nurturing a comprehensive culture that encourages the growth of innovative practices. For example, if the aim is to advance green innovation on a broader scale, organizations should strive to imbue their green values across all aspects of their operations, leading to increased productivity and greater environmental protection. (Imran & Jingzu, 2022). Therefore, businesses must foster a green culture so that they can efficiently participate in green innovation initiatives if they want to earn and maintain a competitive advantage by gaining higher environmental performance. Studies also support similar findings (Küçükoğlu & Pınar, 2016; Gürlek & Tuna, 2018; Imran et al., 2021). Based on this discussion, we can propose that GI can serve as a mediating force between GOC and EP and we make the following hypothesis:

H7: Green Innovation has a significant mediating the effect between Green organizational culture and environmental performance.

Mediation of EMA

As the relationship between EMA and EP is ambiguous, additional variables, such as green innovation, might be added to provide comprehensive results (Huang & Li, 2017; Hadj, 2020). According to a study by (Latan et al., 2018), EMA tools assist firms in making better environmental decisions by providing important environmental information. For instance, when converting raw materials, labor, and other resources into finished goods, many actions have the potential to have an adverse influence on the environment (Phan et al., 2018). However, managers can better understand the tasks and processes used to produce outputs owing to EMA and they can also be more conscious of the activities engaged in daily operations and their effects on the environment (Christine et al., 2019; Zandi & Lee, 2019). There is a case to be made that companies that are more aware of the environmental impact associated with the delivery of their goods and/or services will have a better chance to lessen it, leading to improved environmental performance through decreases in emissions, waste, or resource usage and/or decreases in the costs related to complying with environmental regulations (Latan et al., 2018; Phan et al., 2018; Yaseen, Arshad, & Al-Hyasat, 2023). Since the adoption of EMA is greatly influenced by the GOC the firm has, hence we propose that EMA can act as the underlying path in the associations of GOC and EP. Results from other studies are in line with these, such as by. Thus, using the above discussions, we formulate and test the following hypotheses indicating their mediation effect:

H8: EMA has a significant mediating effect between Green organizational culture and Environmental performance

Mediation of Environmental Strategy

Researchers and practitioners, according to Zhou et al. (2019), have concentrated on environmental strategy in addition to its resources and capabilities. According to (Solovida & Latan, 2017), businesses with environmental strategy do better in terms of the environment than those without. This is in line with recent studies that show the importance of business strategy in predicting both corporate operations and environmental protection (Kraus et al., 2020; Shah & Soomro, 2021). Studies indicate that ES has a significant impact on Environmental Performance (Latan et al., 2018; Kraus et al., 2020; Fatima, Ahmed, & Mahnoor, 2023), however, scholars have highlighted the need to monitor ES's direct and indirect effects on EP owing to its complexity. The author also emphasized the importance of analyzing why and how ES affects EP. Studies show that a strong green culture in an organization incorporates environmental strategies and values in a better way and is instrumental in implementing green organizational strategy, leading to environmental and business performance. Based on these arguments, we propose that ES is an intervening variable linking GOC and EP. Thus, we make the following hypothesis:

H9: Environmental strategy has a significant mediating effect between green organizational culture and environmental performance

Based on NRBV, a theoretical framework proposed by the literature can be visualized in the following Figure 1.

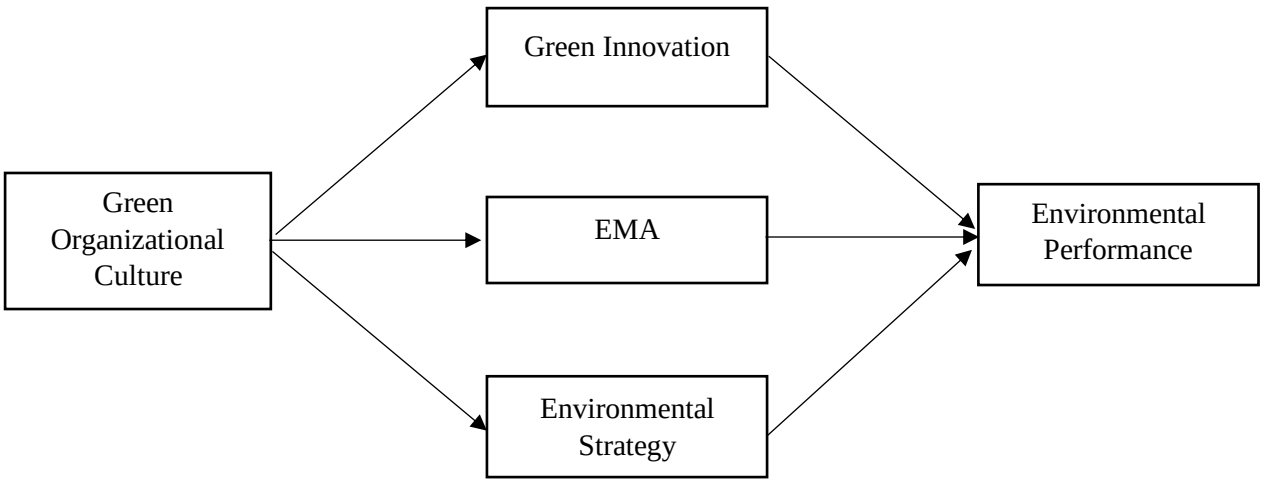

Fig. 1: Research Model
Source: Developed by authors

III. Methodology

This study employs a deductive technique by using and testing NRBV as a supporting theory. The nature of the research design for this study is descriptive as it aims to evaluate the relationship between the study variables. Moreover, the researchers used a quantitative method, gathering numerical data and utilizing statistical software to test it empirically for the presentation of results.

Population and sample

The target population of this study comprises employees working in the pharmaceutical, textile, and chemical manufacturing sectors of Pakistan. Hence, the sample was selected from this population for research purposes using the convenience sampling technique, which is a type of non-probability sampling technique. The sample size was selected according to the formula suggested by (Kock & Hadaya, 2018), according to which the minimum number of participants must be at least ten times the item numbers of the survey instrument.

Data collection and analysis

The data for the study was obtained using a questionnaire as a survey instrument to 290 employees working in the said sector, considering the number of items to be 29. The sample participants replied to items on the questionnaire using a 5-point Likert scale and returned. After scrutiny, 253 questionnaires were recognized as fit for inclusion in the analysis. The latest version SmartPLS 4 was used to analyze the data and deduce the results by evaluating the hypotheses developed using the PLS-SEM technique.

Survey Instrument

The items of the variables were adopted from the previous studies. Responses on GOC were measured on the scale developed by (Wang et al., 2021) and it comprises 6 items, while EP was assessed using 5 items from the scale developed by (Ramanathan, 2018). GI was measured with a total of 8 items and 4 items each of green product and process innovation using the scale (Chen, 2008). These scales were also used in the research of (Imran & Jingzu, 2022). For EMA, 6 items were taken from the study (Christine, 2019; Le, Nguyen, & Phan, 2019). ES was measured with 4 items adopted from a scale by (Walls, Phan, & Berrone, 2008), also utilized by (Latan et al., 2018; Christine et al., 2019) in their studies. Therefore, the instrument made a total of 29 items used to measure the response to the study variables.

IV. Data Analysis

Table 1 depicts the demography of the sample respondents, including information on their gender, educational backgrounds and age range. The fact that nearly 56% of the sample's participants are men and nearly 44% are women demonstrates that the sample is not highly skewed in favor of either gender. With a master's degree at 37.2% and a graduation degree at 59.3%, the sample has a high level of education.

Table 1: Demographic profile of participants

	Dimensions	N	%
Gender	Male	141	55.7%
	Female	112	44.3%
Education	Graduation	150	59.3%
	Masters	94	37.2%
	Others	9	3.6%
Age	18 to 25 Years	39	15.4%
	26 to 30 Year	70	27.7%
	31 to 35 Year	95	37.5%
	36 Year or Above	49	19.4%

Source: Author's own work

In addition to these, 9 individuals possessed other qualifications. The sample is dominated by respondents aged 31 to 35, followed by those aged 26 to 30. Only 49 people have ages greater than 36, and 39 are between 18 and 25 years of age. This demonstrates that the bulk of the sample respondents are middle-aged. The following table

shows the outer loadings of the sample items, along with the Variance Inflation factor (VIF) for the detection of multi-collinearity.

Table 2. Loading and VIF

Items	EMA	EP	ES	GI	GOC	VIF
EMA1	0.81					2.07
EMA2	0.73					1.82
EMA3	0.79					2.04
EMA4	0.74					1.84
EMA5	0.78					2.38
EMA6	0.88					3.17
EP1		0.83				1.98
EP2		0.78				1.98
EP3		0.70				1.59
EP4		0.74				1.68
EP5		0.82				1.97
ES1			0.62			1.42
ES2			0.90			2.68
ES3			0.91			3.11
ES4			0.88			2.55
GI1				0.84		2.73
GI2				0.82		2.66
GI3				0.84		2.97
GI4				0.84		3.01
GI5				0.83		2.61
GI6				0.81		2.52
GI7				0.83		2.89
GI8				0.87		3.31
GOC1					0.85	2.86
GOC2					0.82	2.73
GOC3					0.78	2.03
GOC4					0.85	2.67
GOC5					0.82	2.39
GOC6					0.83	2.21

Source: Author's own work

All of these items have factor loadings that are greater than 0.8, which is significantly higher than the 0.5 cutoff. As a result, we kept all of these things for additional examination. Values for the VIF that are close to 10 suggest significant multicollinearity; however, the Table 2 shows that these values are well below 10, indicating that the data is free of this problem.

The inter-correlations between variables and the discriminant validity of the study scales, as determined by HTMT ratios, are displayed in Table 4 below. Discriminant validity is used to quantify the discrimination among the study variables to guard against any multi-relationship mistakes.

Table 3: Discriminant Validity - HTMT

Constructs	EMA	EP	ES	GI	GOC
EMA	-				
EP	0.703	-			
ES	0.721	0.684	-		
GI	0.743	0.624	0.785	-	
GOC	0.655	0.546	0.55	0.677	-

Source: Author's own work

According to (Henseler, Ringle, & Sarstedt, 2015; Ab Hamid, Sami, & Sidek, 2017), to prove discriminant validity, the HTMT value must be smaller than 0.85. The table above demonstrates that these requirements are met, demonstrating the discriminant validity of the scales. The other values of the correlation of the variable with itself must be less than its correlation with the other variables.

As shown in Table 4, the SmartPLS 4 program was used to test the study's hypothesis using the PLS-SEM method to get the findings. The structural model is also shown in figure 2 below.

Table 4: Hypothesis Testing

Direct Path	Effect	SE	T value	P values	Decision
H1: GOC -> EMA	0.585	0.061	9.637	0.000	Accept
H2: GOC -> ES	0.498	0.053	9.327	0.000	Accept
H3: GOC -> GI	0.632	0.041	15.301	0.000	Accept
H4: GI -> EP	0.101	0.083	1.214	0.225	Reject
H5: EMA -> EP	0.331	0.078	4.230	0.000	Accept
H6: ES -> EP	0.324	0.072	4.480	0.000	Accept
Indirect Effect					
H7: GOC -> GI -> EP	0.064	0.054	1.191	0.234	Reject
H8: GOC -> EMA -> EP	0.193	0.052	3.714	0.000	Accept
H9: GOC -> ES -> EP	0.161	0.039	4.102	0.000	Accept

Source: Author's own elaboration

Seven of the nine hypotheses developed for the study were accepted since their significance values were near zero and their t-values were higher than 1.96. The affirmation of hypotheses H1, H2, and H3 shows a strong correlation between the GOC and other research variables, such as EMA, ES, and GI respectively. This shows strong direct effects among these variables. Moreover, H5 and H6 were also accepted as they lay within the threshold significance level with moderate effect. Hence, this also confirms the direct effects of EMA and ES on EP. However, H4 was rejected since the p-value was higher than 0.05, which indicated that GI and EP are not related significantly. Regarding the indirect effects, H7 was rejected, while H8 and H9 were accepted as they depicted significant results. These findings proved that both EMA and ES were significant mediators between GOC and EP, while GI did not prove to have significant mediation effects between the two variables.

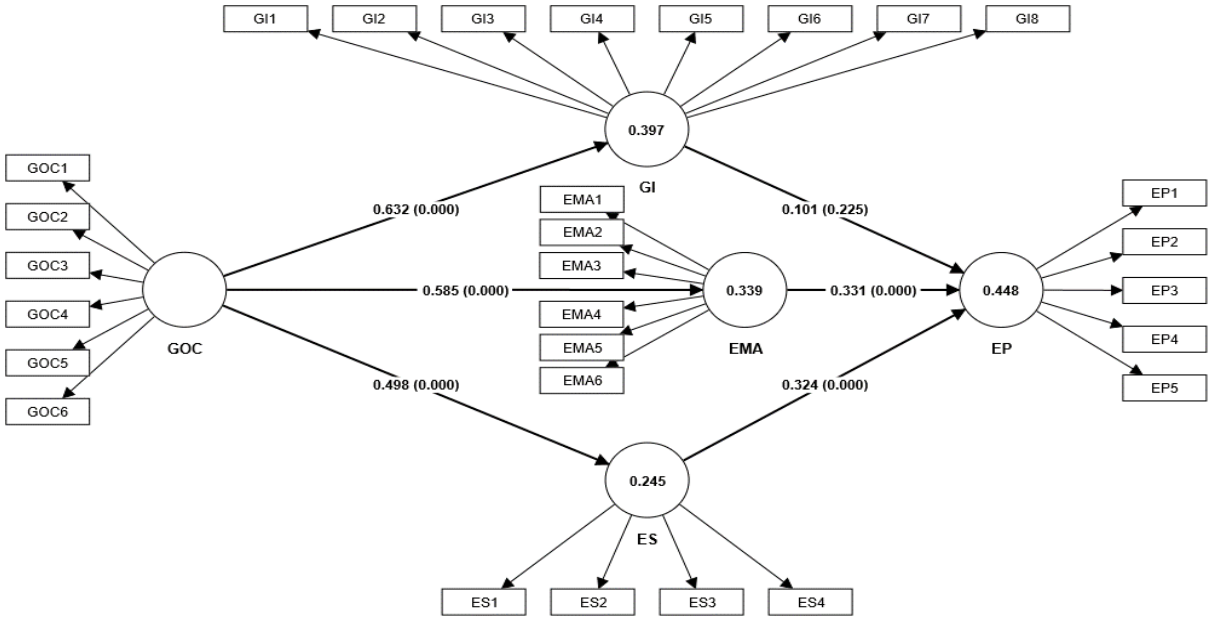

Figure 2: Structural model
Source: Author's own work

V. Discussion and Conclusion

The study was to investigate the indirect effects of green organizational culture on the firm's environmental performance through GI, EMA and ES. The findings showed that EMA and ES significantly predicted EP. (Latan et al., 2018; Christine et al., 2019) put forward similar findings. ES is also considered to be a crucial tool for boosting EP as the setting of proper environmental goals and their proper implementation allows firms to track their progress and leads to optimizing resources, using energy-efficient technologies, and lessening the negative environmental effects through emission and wastage reduction. Similarly, the literature supports that firms through accurate incorporation of EMA saves cost, gain competitive advantage, create more demand for sustainable products, and position themselves as responsible corporate firms (Amir, Siddique, & Ali, 2022; Amir et al., 2023). Therefore, firms can comply better with the environmental regulations and this leads to betterment of the relations with stakeholders and raising the performance indicators. As a result, their financial and environmental performance increases and they achieve long-term sustainability. It is important to note that results could not prove GI to be contributing to the firm's EP, which is contrary to the findings of (Imran et al., 2021; Noor & Bano, 2024). The cause of this insignificant relationship may be attributed to external factors, such as regulations, market demand, implementation challenges, and financial constraints, which may hinder the process of gaining from innovation by integrating such practices into the core business strategies for improved environmental performance.

The study also found that GOC is also a strong determinant of EMA, GI, and ES, similar to the findings by (Zandi & Lee, 2019; Aftab et al., 2023; Masood, 2024). Research shows that since GOC encompasses the knowledge and expertise of employees regarding environmental issues, they are likely to generate innovative ideas and solutions for environmental challenges by allocating resources for research and development through R&D teams and partnerships. An open GOC allows workers to share ideas and collaborate on green initiatives, which may be used to measure and track EP. Additionally, GOC allows departments in an organization to collaborate effectively for a more holistic implementation of ES. This allows the business to work through continuous improvement and make adjustments to enhance its sustainability efforts. Commitment from top management is seen in organizations with GOC where environmentally friendly activities are prioritized and proactive risk assessment is done to identify potential environmental risks and develop strategies accordingly to mitigate them effectively. Furthermore, as GOC values environmental responsibility, such values are deeply ingrained in the company's culture, which allows for a natural alignment with the principles of EMA. Hence, by measuring and managing the environmental impact of business operations accurately, the performance metrics are reported transparently, enhancing the trust of the stakeholders. A business that practices GOC is inclined to make its employees environmentally aware, due to which they proactively engage in and adopt EMA practices. In addition to the above-mentioned direct effects, this study also tested for the mediating roles of these variables between GOC and EP. The empirical tests revealed that out of these, GI had no role in leading GOC to EP. However, both ES and EMA were strong mediators between them. Therefore, we claim that GOC can effectively promote EMA practices and effectively enforce ES, which increases the firms' performance regarding the environment.

Businesses are constantly under pressure to reduce the negative consequences of their activities and simultaneously improve their environmental performance as a result of the growing concern for environmental protection. Accordingly, the current study investigated the circumstances and means by which GOC can change EP. Based on a thorough empirical investigation with a sample of manufacturing companies from Pakistan, nine hypotheses were developed and tested statistically. Based on the results and discussion, the study brought the conclusion that GOC has significant direct impacts on EMA, GI, and ES, whereas it also indirectly contributes to EP through EMA and ES. However, GI did not act as a significant intervener between GOC and EP. EMA and ES were also found to directly impact EP, while it remained unaffected with varying GI. Thus, if manufacturing businesses are encouraged to conduct their operations in an environmentally responsible manner via incorporating an organizational culture that fosters green innovation, robust practices of management accounting and building strategies that are friendly to the environment are likely to increase their revenues and advance sustainable development as well.

Research implications

This study has important theoretical implications, since, in the first place, it adds to the literature on the Resource-based view and the NRBV philosophy by illuminating the elements that are most likely to raise a firm's EP. Second, the study advances earlier research on the idea of EP by demonstrating the beneficial contribution that green organizational culture makes to EP. Thirdly, the current study contributes by inferring the route taken by GI, EMA, and ES to create correlations between GOC and EP. Fourthly, the paper makes another significant

addition to the body of knowledge by incorporating a novel integration of these variables in terms of context. To the best of the researcher's knowledge, no study has ever used a sample from Pakistan for such a combination of characteristics, which makes the study original and worthy. As a result, this research deepens academic knowledge and adds to the body of work on EP predictors.

The study reveals important results for the managers and policymakers for their persistence and decision-making in favor of the environment. First, the study highlights because managers must cultivate a green culture in their organizations for better performance through lower emissions, efficient resource consumption, and less waste generation. Second, by demonstrating a commitment to sustainability and environmental responsibility through developing effective strategies, firms' reputations may be boosted, and resultantly, consumers and stakeholders will support companies that prioritize environmental concerns, translating into increased customer loyalty. Third, firms can address environmental concerns by monitoring the metrics by adopting EMA tools, mitigating risks, and eradicating chances for loss. Finally, managers can encourage their workers to seek innovative ways to reduce environmental impacts to develop a more sustainable and responsible business network. In short, adopting these practices can lead to tangible benefits such as cost savings and increased efficiency while also contributing to broader environmental goals and societal well-being. Similarly, governments can encourage businesses to adopt environmentally friendly practices by giving them incentives, such as tax cuts, grants, or subsidies. Policymakers can develop business environmental reporting rules, that forces businesses to disclose their environmental practices and performance. Hence, the accountability and transparency of the reporting will improve and firms will abide by the laws for higher profits and sustainability.

Limitations and Future indications

Despite the significant findings of the present study, the limitations of our results demand more investigations. Firstly, our study emphasized factors to ascertain how well manufacturing enterprises performed in terms of the environment. It may be claimed, however, that other firm-level factors, such as firm size, leadership, commitment of workers, etc. might also complement the impact of EP. If the following research integrates firm-level constructs from our analysis, the literature on EP and business strategy may be strengthened. Second, even though we examined the extent to which EMA, GI, and ES could mediate the linkage of GOC and EP, further boundary or intervening factors need to be investigated, which could play an important role. Therefore, relevant moderators and mediators can be included in future research. Thirdly, we limited our research to Pakistan, a recently emerging but little-researched region. Even though the sample was limited to one country, future researchers must increase the sample size by incorporating additional nations or conducting a cross-country comparison and taking into consideration various contextual distinctions among emerging and developed nations that can enhance businesses' environmental performance. Lastly, an intra-industry analysis may also prove useful to understand the individual contribution of each industrial sector to the performance of firms.

Competing interest statement

All the authors have no competing conflict of interest

Author(s) Contribution Statement

Qingmei Tan contributed to the conception and design of the study. Muhammad Abubakar Tahir wrote the introduction and literature sections. Muhammad Haroon Rasheed and Kamran Ali collected and organized the dataset, performed the statistical analysis and interpretation of the results. Kamran Ali reviewed this study according to the academic structure. All authors contributed to the manuscript revision, read, and approved the submitted version.

Research Project Funding:

This study is funded by the Fundamental Research Funds for the Central Universities, NO.NJ2023035 and NC2024008

References

Ab Hamid, M., Sami, W., & Sidek, M. M. (2017). Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion. *Journal of Physics: Conference Series*, 840(1), 012163. http://doi.org/10.1088/1742-6596/890/1/012163

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. *Business Strategy and the Environment, 32*(4), 1782-1798. https://doi.org/10.1002/bse.3219

Alaeddin, O. (2019). The effect of management accounting systems in influencing environmental uncertainty, energy efficiency and environmental performance. J*ournal of Energy Economics and Policy*, 9(5), 346-342. http://doi.org/10.32479/ijeep.8279.

Albino, V., Balice, A., & Dangelico, R. M. (2009). Environmental strategies and green product development: an overview on sustainability-driven companies. *Business Strategy and the Environment, 18*(2), 83-96. https://doi.org/10.1002/bse.638

Ali, K., Amir, M., & Malik, M. S. (2023). Strategic motives, proactive environmental strategies and corporate performance: Role of business model innovation and competitive intensity. *Pakistan Journal of Commerce and Social Sciences (PJCSS), 17*(2), 348-369.

Amir, M., Malik, M. S., & Ali, K. (2024). Unlocking green growth: an ARDL estimation of pollution prevention practices for economic and environmental sustainability. *Environment Development and Sustainability, 26*(8), 19983-20000. http://doi.org/10.1007/s10668-023-03449-w

Amir, M., Siddique, M., & Ali, K. (2022). Responsible leadership and business sustainability: Exploring the role of corporate social responsibility and managerial discretion. *Business and Society Review, 127*(3), 701-724. http://doi.org/10.1111/basr.12284

Amir, M., Siddique, M., Ali, K., & Kausar, N. (2023). Environmental Awareness During COVID-19: Spur Organizational Performance through Environmental Motivation and Environmental Management System. *South Asian Journal of Management Sciences, 17*(2), 1-13. http://doi.org/10.21621/sajms.2023172.01

Anthony Jr, B. (2019). Green information system integration for environmental performance in organizations: An extension of belief–action–outcome framework and natural resource-based view theory. *Benchmarking: An International Journal, 26*(3), 1033-1062. https://doi.org/10.1108/BIJ-05-2018-0142

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management, 17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Barney, J., Wright, M., & Ketchen Jr, D. J. (2001). The resource-based view of the firm: Ten years after 1991. *Journal of management, 27*(6), 625-641. https://doi.org/10.1177/014920630102700601

Chen, Y.-S. (2008). The driver of green innovation and green image–green core competence. *Journal of Business Ethics, 81*, 531-543. https://doi.org/10.1007/s10551-007-9522-1

Christine, D. (2019). The relationship of environmental management accounting, environmental strategy and managerial commitment with environmental performance and economic performance.

Christine, D., Yadiati, W., Afiah, N. N., & Fitrijanti, T. (2019). The relationship of environmental management accounting, environmental strategy and managerial commitment with environmental performance and economic performance. *International Journal of Energy Economics and Policy, 9*(5), 458-464.

Deb, B. C., Rahman, M. M., & Rahman, M. S. (2022). The impact of environmental management accounting on environmental and financial performance: empirical evidence from Bangladesh. *Journal of Accounting & Organizational Change*, 9(3), 420-466. https://doi.org/10.1108/JAOC-11-2021-0157

Fatima, K., Ahmed, A., & Mahnoor, A. H. S. (2023). Green Intellectual Capital Driving Environmental Performance: The Mediating Role of Green Ambidexterity and Moderating Influence of Environmental Ethics. *Sustainable Trends and Business Research, 1*(2), 62-75. https://doi.org/10.70291/stbr.1.2.2023.7

Fernando, Y., & Wah, W. X. (2017). The impact of eco-innovation drivers on environmental performance: Empirical results from the green technology sector in Malaysia. *Sustainable Production and Consumption, 12*, 27-43. https://doi.org/10.1016/j.spc.2017.05.002

Fousteris, A. E., Didaskalou, E. A., Tsogas, M.-M. H., & Georgakellos, D. A. (2018). The environmental strategy of businesses as an option under recession in Greece. *Sustainability, 10*(12), 4399. https://doi.org/10.3390/su10124399

Gürlek, M., & Tuna, M. (2018). Reinforcing competitive advantage through green organizational culture and green innovation. *The service industries journal, 38*(7-8), 467-491. https://doi.org/10.1080/02642069.2017.1402889

Hadj, T. B. (2020). Effects of corporate social responsibility towards stakeholders and environmental management on responsible innovation and competitiveness. *Journal of cleaner production, 250*, 119490. https://doi.org/10.1016/j.jclepro.2019.119490

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of management review, 20*(4), 986-1014.

Hart, S. L., & Dowell, G. (2011). Invited editorial: A natural-resource-based view of the firm: Fifteen years after. *Journal of management*, *37*(5), 1464-1479. https://doi.org/10.1177/0149206310390219

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, *43*(1), 115-135. https://doi.org/10.1007/s11747-014-0403-8

Huang, J.-W., & Li, Y.-H. (2017). Green innovation and performance: The view of organizational capability and social reciprocity. *Journal of business ethics*, *145*, 309-324. https://doi.org/10.1007/s10551-015-2903-y

Imran, M., Arshad, I., & Ismail, F. (2021). Green organizational culture and organizational performance: The mediating role of green innovation and environmental performance. *Jurnal Pendidikan IPA Indonesia*, *10*(4), 515-530.

Imran, M., & Jingzu, G. (2022). Green organizational culture, organizational performance, green innovation, environmental performance: A mediation-moderation model. *Journal of Asia-Pacific Business*, *23*(2), 161-182. https://doi.org/10.1080/10599231.2022.2072493

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information systems journal*, *28*(1), 227-261. https://doi.org/10.1111/isj.12131

Kraus, S., Rehman, S. U., & García, F. J. S. (2020). Corporate social responsibility and environmental performance: The mediating role of environmental strategy and green innovation. *Technological forecasting and social change*, *160*, 120262. https://doi.org/10.1016/j.techfore.2020.120262

Küçükoğlu, M. T., & Pınar, R. İ. (2016). The mediating role of green organizational culture between sustainability and green Innovation: A research in Turkish companies.

Latan, H., Jabbour, C. J. C., de Sousa Jabbour, A. B. L., Wamba, S. F., & Shahbaz, M. (2018). Effects of environmental strategy, environmental uncertainty and top management's commitment on corporate environmental performance: The role of environmental management accounting. *Journal of Cleaner Production*, *180*, 297-306. https://doi.org/10.1016/j.jclepro.2018.01.106

Le, T. T., Nguyen, T. M. A., & Phan, T. T. H. (2019). Environmental management accounting and performance efficiency in the Vietnamese construction material industry—A managerial implication for sustainable development. *Sustainability*, *11*(19), 5152.

Leal-Rodríguez, A. L., Ariza-Montes, A. J., Morales-Fernández, E., & Albort-Morant, G. (2018). Green innovation, indeed a cornerstone in linking market requests and business performance. Evidence from the Spanish automotive components industry. *Technological forecasting and social change*, *129*, 185-193. https://doi.org/10.1016/j.techfore.2017.07.021

Liu, Z., Wang, H., & Li, P. (2018). The antecedents of green information system and impact on environmental performance. *International Journal of Services, Economics and Management*, *9*(2), 111-124. https://doi.org/10.1504/IJSEM.2018.096074

Malik, M. S., Ali, K., Amir, M., Tariq, K., & Ramzan, M. (2024). Green transformational leadership, environmental strategy, and green innovation: Mediated moderation of knowledge sharing and green absorptive capacity. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, *18*(2), 503-526.

Masood, F. (2024). Optimizing Accounting-Based Financial Performance: The Role of Corporate Social Responsibility and Independent Board Structures in Pakistan. *Sustainable Trends and Business Research*, *2*(1). https://doi.org/10.70291/stbr.2.1.2024.14

Mayndarto, E. C., & Murwaningsari, E. (2021). The effect of environmental management accounting, environmental strategy on environmental performance and financial performance moderated by managerial commitment. *Journal of Industrial Engineering & Management Research*, *2*(2), 35-38.

Niu, J., Chang, C.-P., Yang, X.-Y., & Wang, J.-S. (2017). The long-run relationships between energy efficiency and environmental performance: Global evidence. *Energy & Environment*, *28*(7), 706-724. https://doi.org/10.1177/0958305X17724210

Noor, A., & Bano, A. (2024). Impact of Green Intellectual Capital and Environmental Management Accounting on Sustainable Performance: The Moderating Role of Stakeholder Pressure. *Sustainable Trends and Business Research*, *2*(1).

Ong, T. S., Lee, A. S., Teh, B. H., & Magsi, H. B. (2019). Environmental innovation, environmental performance and financial performance: Evidence from Malaysian environmental proactive firms. *Sustainability*, *11*(12), 3494.

Phan, T. N., Baird, K., & Su, S. (2018). Environmental activity management: its use and impact on environmental performance. *Accounting, Auditing & Accountability Journal*, *31*(2), 651-673.

Ramanathan, R. (2018). Understanding complexity: The curvilinear relationship between environmental performance and firm performance. *Journal of Business Ethics*, *149*, 383-393.

Saeidi, S. P., Othman, M. S. H., Saeidi, P., & Saeidi, S. P. (2018). The moderating role of environmental management accounting between environmental innovation and firm financial performance. *International Journal of Business Performance Management*, *19*(3), 326-348.

Schein, E. H. (1992). How can organizations learn faster?: the problem of entering the Green Room.

Scholz, P., & Voracek, J. (2016). Organizational culture and green management: innovative way ahead in hotel industry. *Measuring Business Excellence, 20*(1), 41-52.

Shah, N., & Soomro, B. A. (2021). Internal green integration and environmental performance: The predictive power of proactive environmental strategy, greening the supplier, and environmental collaboration with the supplier. *Business Strategy and the Environment, 30*(2), 1333-1344.

Solovida, G. T., & Latan, H. (2017). Linking environmental strategy to environmental performance: Mediation role of environmental management accounting. *Sustainability Accounting, Management and Policy Journal, 8*(5), 595-619.

Tahir, R., Athar, M. R., Faisal, F., & Solangi, B. (2019). Green organizational culture: A review of literature and future research agenda. *Annals of Contemporary Developments in Management & HR (ACDMHR), Print ISSN*, 2632-7686.

Walls, J. L., Phan, P., & Berrone, P. (2008). *Assessment of the construct validity of environmental strategy measures*: Ross School of Business Ann Arbor, MI.

Wang, H., Khan, M. A. S., Anwar, F., Shahzad, F., Adu, D., & Murad, M. (2021). Green innovation practices and its impacts on environmental and organizational performance. *Frontiers in Psychology, 11*, 553625.

Yaseen, A., Arshad, S., & Al-Hyasat, S. S. M. (2023). Corporate Environmental Ethics: Catalyst for Green Innovation and Business Performance in Pakistan's Healthcare Manufacturing Sector. *Sustainable Trends and Business Research, 1*(2).

Zandi, G., & Lee, H. (2019). Factors affecting environmental management accounting and environmental performance: An empirical assessment. *International Journal of Energy Economics and Policy, 9*(6), 342.