Sustainable Competitiveness in Manufacturing: Examining the Role of ESG and Green Innovation in Egypt

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Abstract

This study contributes to the understanding of how factors as ESG and green innovation can influence competitive advantage of Egyptian manufacturing firms by developing Sustainable Management Performance (SMP). For the purpose of this analysis, a questionnaire was created and data were collected from 33 Egyptian manufacturing firms. PLS-SEM analysis technique was used, on 367 responses after checking their validity and completeness. The findings indicate that the hypotheses are supported. ESG practices are found to positively impact firms' capabilities and resources to reduce uncertainty resulting from the rapidly changing business environments. This, in turn, creates value by developing a competitive advantage on the long term, having a positive impact on sustainable management performance in the Egyptian context. Therefore, firms are advised to incorporate ESG practices in their management strategies and to contribute towards green investments and higher innovations, which has a great societal impact, to gain trust, restore confidence and build an image, which will eventually lead to higher financial performance.

Introduction

Firms nowadays face plenty of challenges to survive in the business environment, due to the technological changes arising, the constantly evolving markets and the pandemics, therefore, firms which fail to adapt may lose competitiveness and market position (Liang et al., 2022). Financial performance has always been the main concern for researchers in previous studies; however, firms are now more concerned with social and environmental impacts in order to fulfill stakeholders' expectations, through other non-financial measures such as ESG practices (Ben-Amar et al., 2017; Schaltegger and Hörisch, 2017). ESG is now believed to play a vital role in the firm's survival strategy (Liang et al., 2022). According to Barney et al. (2021) firms must create value in order to maintain competitive advantage, hence, firms are encouraged to enhance their innovation capabilities in an attempt to grow and adapt to the rapidly changing business environment (Moreira et al., 2024).

This study relies on two main theories. First, the Stakeholder Theory, which draws attention to satisfying stakeholders' needs, rather than prioritizing shareholders' interests (Alhazemi, 2025). Second, the Dynamic Capabilities Theory, which focuses on firms using their innovation capabilities and resources so that they can create value and achieve competitive advantage in the long-term in such evolving business environments (Teece et al., 1997; Teece, 2007; Liang et al., 2022; Barney et al., 2021; Bhandari et al., 2022).

This study has two main contributions. First, it analyzes the indirect impact of ESG practices on sustainable management performance (SMP), using green innovation a mediator. Second, this research tends to focus on a developing country such as Egypt, unlike previous studies which tend to focus on

developed countries, such as Korea, as in Liang et al. (2022). This study contributes to the understanding of how such factors as ESG and green innovation can influence competitive advantage of Egyptian manufacturing firms by developing Sustainable Management Performance (SMP). This paper starts with a literature review and hypotheses development, followed by the research methodology, findings and discussion, conclusion and implications, and limitations and suggestions for future research.

Literature Review

This study analyzes the impact of ESG strategy on green innovation, with green innovation serving as a mediator and its impact on the sustainable management performance (SMP) to promote competitive advantage of Egyptian manufacturing firms.

ESG Strategy

ESG standards evaluate three main dimensions related to firms' ethical and sustainability practices; these are environmental, social and governance dimensions (Lee et al., 2023; Litvinenko et al., 2022). The environmental dimension is associated with initiatives of reducing greenhouse gas emissions, using renewable energy sources, and adopting green policies where appropriate (Litvinenko et al., 2022; Kim and Kim, 2021; Tripopsakul and Puriwat, 2022; Alhazemi, 2025). The social dimension is focused on firms' social responsibility practices from fair labor laws and human rights, product safety measures, and contributing to community development (Drempetic et al., 2020; Alhazemi, 2025). The governance dimension is associated with following the rules and regulations set by the government, in addition to the corporate ethics and the stakeholder involvement (Lee et al., 2023; Alhazemi, 2025). ESG practices are meant to engage stakeholders and contribute to higher sustainability, aligning with the stakeholder theory.

The implementation of such ESG strategies play a vital role in achieving a firm's sustainable growth and enhancing profitability on the long run. Therefore, it became necessary for firms to redesign their management strategies in such rapidly changing business environments (Liang et al., 2022). The aim is for firms to enhance their capabilities and resources so that they can create value and achieve competitive advantage (Teece, 2007). Relying on the dynamic capabilities theory, ESG practices help firms to integrate sustainable development with innovative development. This is accomplished in various ways of reducing energy consumption and harmful emissions, promoting higher investments in green innovation, acquiring advanced technologies necessary for environmental protection purposes and achieving cleaner production (Zhang and Chen, 2023). Relying on the above discussion, the impact of ESG on green innovation in Egyptian manufacturing firms is worth analyzing. Hence, the following hypothesis can be generated.

H1: ESG practices have a positive impact on green innovation of firms.

Green Innovation

Green innovation refers to the firm's potential to generate new products and processes, based on knowledge and new ideas, which create value for all stakeholders (Lawson and Samson, 2001; Moreira et al., 2024). There are various frameworks which explain this concept, from Lawson and Samson (2001), who identified seven dimensions related to a firm's strategy, skills, operations, creativity, structure, culture, and technology, to Zawislak et al. (2012), who identified only four—technology, management, operations, and transaction capability. Due to the rapidly changing business environments and the higher competition between firms for survival, firms can no longer rely on their core resources, but rather they need to seek for dynamic capabilities in order to adapt, innovate and obtain long-term sustainability (Teece, 2007; Liang et al., 2022). Even though, Wang and Ahmed (2007), Wilhelm et al. (2015) and Girod and Whittington (2017), confirm a positive link between the presence of such dynamic capabilities and firm performance, Zahra et al. (2006) find no significant relationship between the two. However, such studies were mainly focused on the firms' financial performance, rather than on sustainability, which has become the focus of the society and stakeholders, as it forms the basis for achieving competitive advantage (Henderson, 2021, Liang et al., 2022). It was even observed by Liang et al. (2022) that absorptive and adaptive capabilities significantly enhance sustainable management performance, when ESG strategies act as a mediator. Therefore, for the purpose of this analysis, and relying on the dynamic capabilities theory, the impact of green innovation on sustainable management performance is worth analyzing in the Egyptian context.

H2: Green innovation has a positive impact on sustainable management performance.

Sustainable management performance

Sustainable management performance (SMP) tends to support competitiveness of firms on the long run, as it enables firms to achieve competitive advantage in dynamic business environments (Barney et al., 2021; Bhandari et al., 2022, Liang et al., 2022). Relying on the stakeholders theory and the dynamic capabilities theory, firms must adapt capabilities and strategies which reduce uncertainty and focus on satisfying stakeholders' needs, rather than prioritizing shareholders' interests (Freeman et al., 2021; Henderson, 2021; Gueler and Schneider, 2021). Therefore, firms tend to redefine their strategies to combine internal and external resources, to acquire the necessary dynamic capabilities, which meet stakeholders' expectations and help enhance SMP. Based on this, the study examines the indirect impact of ESG practices on sustainable management performance through green innovation, to enhance the competitive advantage of Egyptian manufacturing firms.

H3: Green innovation has a mediating effect between ESGS and sustainable management performance.

Research Methodology

This study relies on the stakeholder theory and the dynamic capabilities theory, to analyse the impact of ESG strategy on green innovation, and its impact on the sustainable management performance of Egyptian manufacturing firms, as presented in figure 1 below. Green innovation is used as mediator, as it is expected to have a direct impact on SMP, enhancing long term competitiveness, responding to stakeholders' expectations and positively impacting environmental and social outcomes.

Figure 1: Research model

The model was developed using 19 candidate items from literature, but only 15 items were selected as relevant for Egyptian manufacturing firms. ESG strategy (ESGS) measures the firms' efforts related to environmental management, performance evaluation, workplace improvement, protection of shareholders' rights, and satisfaction of stakeholders' needs (Liang et al., 2022). Green innovation (GRIN) measures a firm's sustainable product design and manufacturing practices, including material selection, recyclability, pollution reduction, and protection of natural resources (Wen et al., 2023; Bhat and Abdelwahed, 2025). Sustainable Management Performance (SMP) evaluates the profitability of firms, growth of market share, efforts of social responsibility, reduction of carbon emissions, and the overall environmental performance in relation to competitors over the past five years (Wu et al., 2016; Abdul-Rashid et al., 2017; Liang et al., 2022).

In order to test construct validity, a reflective measurement model was applied (Hair et al., 2021; Bhat et al., 2024a). The questionnaire was created in both languages of English and Arabic, in order to enhance accessibility. Data was collected from 33 Egyptian manufacturing firms, meeting the recommended sample size of 10 cases for every path of the model. Purposive Sampling was used where the participants were selected to hold certain positions from directors, to CSR managers, quality and operations managers, as well as, CEOs, and board members, due to their knowledge of business and sustainability practices (Dabela et al., 2023). 421 questionnaires were distributed, but only 367 were used after checking their validity and completeness before resuming with the analysis. For the purpose of the study, PLS-SEM analysis technique was used, since this approach is particularly relevant, given its constraint sample size (Bhat et al., 2024b). PLS-SEM is able to handle non-normal data distributions, which makes it appropriate after checking the skewness and kurtosis which suggest deviation from normality. It is also suitable for smaller sample sizes, compared to CB-SEM, with only 367 responses, PLS-SEM analysis technique becomes more relevant (Hair et al., 2019).

Findings and Discussion

Table 2 indicates the important insights into the relationships between ESG strategies, green innovation, and SMP of Egyptian manufacturing firms. First, the table indicates a sig level of 0.000 for the impact of ESG strategy on green innovation, which indicates a significant relationship between the two, as suggested in the first hypothesis. A positive relationship is indicated by the 0.656, presented in table 2, which accepts the first hypothesis. This finding is consistent with the findings of Zhang and Chen (2023). This finding indicates that Egyptian manufacturing firms tend to apply ESG practices, as they redesign their management strategies to respond to the changing business environments, in an attempt to enhance their capabilities and resources, which eventually lead to value creation and higher competitive advantage. This indicates the firms' contribution towards the reduction of energy consumption and harmful emissions, higher investments of green innovation, and advanced technologies assisting in environmental protections and cleaner production. This finding is also consistent with the dynamic capabilities theory, as ESG practices tend to help firms to integrate sustainable development with innovative developments.

Second, the table indicates a sig level of 0.000 for the impact of green innovation on sustainable management performance, which indicates a significant relationship. A positive relation is also observed from the 0.468 presented in table 2 below, which accepts the second hypothesis as well. This finding is consistent with the findings of Liang et al. (2022). It is also consistent with the dynamic capabilities theory and the stakeholder's theory. This finding indicates that Egyptian manufacturing firms tend to adapt strategies, which combine internal and external resources to acquire the necessary dynamic capabilities, which reduce uncertainty, in an attempt of satisfying stakeholders' needs and expectations. This results in higher competitive advantage of firms on the long term, and enhancing sustainable management performance (Barney et al., 2021; Bhandari et al., 2022).

Third, the table indicates a sig level of 0.001 for the indirect mediation effect of green innovation between ESG practices and sustainable management performance, which indicates a significant relationship. A positive relation is also observed from the 0.319 presented in table 2, which accepts the third hypothesis, presenting full mediation. This finding is supported by the dynamic capabilities theory and the stakeholder's theory. This finding indicates that ESG strategies adopted by manufacturing firms in Egypt tend to indirectly lead to sustainable management performance, through the adoption and enhancement of the appropriate green innovation techniques available.

Table 2: Hypotheses Testing

H	***Path Relationship***	***β***	***(STDEV)***	***T Value***	***P Values***	***2.50%***	***97.50%***	***Decision***
H1	ESGS -> GRIN	0.656	0.028	23.801	0.000	0.600	0.709	Accepted
H2	GRIN -> SMP	0.468	0.064	7.319	0.000	0.341	0.593	Accepted
Mediation Analysis								
	Path Relationship	**Direct Effect (β, p)**	**Indirect Effect (β, p)** ESGS→ GRIN → SMP		**Total Effect (β, p)**		**Mediation Type**	**Result**
H3	ESGS→ GRIN → SMP	–0.041 (p = 0.378)	0.319 (p < 0.001)		0.401 (p < 0.001)		Full mediation	Accepted

Where: ESGS: ESG strategy; GRIN: Green innovation; SMP: Sustainable management Performance

Conclusion and Implications

The study reveals a relationship between ESG strategies, green innovation, and sustainable management performance of Egyptian manufacturing firms. Firms are found to apply ESG practices and redesign their management strategies to better respond to dynamic business environments, in an attempt to enhance their innovation capabilities and resources, in order to reduce uncertainty and satisfy stakeholders' expectations. This leads to a higher competitive advantage of firms on the long term, and enhancing sustainable management performance. These findings align with the Stakeholder Theory, and the Dynamic Capabilities Theory. Hence, Egyptian manufacturing firms make an effort to translate green investments into innovations, which can contribute towards societal challenges, due to its mediation effect between ESG strategies and sustainable management performance.

These findings can reveal new insights for Egyptian manufacturing firms to implement. For one thing, these firms are highly advised to incorporate ESG practices in their management strategies in order to gain a long-term competitive advantage, which makes the firm stand out, especially in this constantly evolving business environment. Firms applying ESG practices tend to gain trust from the different stakeholders, and boost confidence as they fulfill stakeholders' expectations. Another thing, firms are highly advised to invest in research and development (R&D), new green technologies and operational improvements, which contribute to energy savings and waste reductions, as a way of enhancing their innovation capabilities to benefit the society. In addition, firms can also consider dealing with suppliers who also adopt ESG practices, while engaging with employees and customers to build a sustainable business environment. Meanwhile, policy makers may consider facilitating the partnerships between local and international firms, to share green technologies and build R&D partnerships, to enhance sustainability practices. They may also provide tax benefits for firms adopting green innovations and ESG strategies, as a way of supporting them.

Limitations and Suggestions for future research

This study faces some limitations. One of the limitations is having to rely solely on manufacturing firms for analysis, so results may not be generalized to other types of firms. Hence, there comes the suggestion of holding the same analysis on different types of businesses to generalize the results. Another limitation, is analyzing the impact of a limited number of factors on SMP of those firms, while other factors may prove to be equally important and impose high impact on SMP as well. Therefore, using other mediators or adding moderators to the model may provide a wider understanding of the topic and a better view of factors influencing SMP of firms. Moreover, this study was based only on Egypt, as a developing country; hence, basing the analysis on a different developing country or conducting a comparative analysis, may be useful to investigate the impact of the model in different contexts.

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