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Strategic green marketing orientation and environmental sustainability in sub-Saharan Africa: Does green absorptive capacity moderate? Evidence from Tanzania

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ABSTRACT

Small and medium-sized enterprises are increasingly promoting environmental sustainability, a trend that has raised environmental awareness and inspired individuals and organizations to work together to create a more sustainable and greener future by implementing environmentally friendly practices. This study examines the influence of strategic green marketing orientation on environmental sustainability. Also, the study examines the moderating effect of green absorptive capacity on the relationship between strategic green marketing orientation and environmental sustainability. We used partial least squares structural equation modelling to test hypotheses with data obtained from 391 manufacturing enterprises in Tanzania via structured questionnaires. Our study's main findings show that strategic green marketing orientation has a significant and positive influence on environmental sustainability, and green absorptive capacity strengthens the positive effect of strategic green marketing orientation on environmental sustainability. Although there is scholarly interest in incorporating environmental considerations into business endeavors, there is little evidence on ways that a strategic green marketing orientation promotes environmental sustainability in a manufacturing context. Thus, our findings add to the literature on understanding environmental sustainability for manufacturing enterprises by revealing the role of strategic green marketing orientation and green absorptive capacity in explaining environmental sustainability. The study suggests that manufacturing enterprises should integrate environmental considerations into their strategic resources and endeavors to improve eco-friendly outcomes.

1. Introduction

Environmental sustainability has emerged as a significant challenge in developing economies, including sub-Saharan Africa [1,2,3]. The manufacturing sector in sub-Saharan countries, including Tanzania, has been identified as a contributor to environmental sustainability issues due to malpractices, such as the emission of CO_2 [4,1,2]. For example, between 2016 and 2019, CO_2 emissions from the manufacturing sector in sub-Saharan countries increased from 784,540.02 to 823,770.02 kilotons [1]. This represents a growth rate of 3% in 2019, from 2% in 2016 [1]. This upward trend in environmental pollution in sub-Saharan countries runs counter to the global efforts aimed at promoting environmental sustainability across various sectors, including manufacturing [5,6]. Similar to

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other developing economies, manufacturing firms in sub-Saharan countries, including Tanzania, face pressure from authorities, international agencies, and stakeholders to comply with environmental standards and regulations [7]. In response to these concerns, the government has introduced the National Environmental Policy of 2021, which establishes a legal-policy framework, guidelines, and strategies to foster environmental sustainability [8]. Additionally, manufacturing firms are encouraged to align their objectives with Sustainable Development Goals (SDGs) 11 and 12. These goals specifically aim to create inclusive, safe, and sustainable cities and settlements, as well as promote sustainable consumption and production patterns [9,10]. However, despite these efforts, limited progress has been made in advancing environmental sustainability in sub-Saharan countries [1]. Therefore, given the pressing need to enhance environmental sustainability in sub-Saharan countries, our study holds significant relevance [11,1].

Empirical research suggests that efforts to align institutional arrangements with SDGs demand firms to move towards environmentally friendly production methods [12,13,14]. This aligns with institutional reforms that establish a framework supporting environmentally friendly practices, thus enabling manufacturing firms to achieve environmental sustainability. Institutional theorists argue that institutional arrangements and processes are drivers of adopting and implementing sustainable practices [15,16]. In the context of environmental sustainability, institutional theory highlights the role of various institutional arrangements, such as corporate culture, practices, regulations, etc., in promoting environmental sustainability efforts [17]. Environmentally friendly practices and production aims to contribute to environmental sustainability within the manufacturing sector [18]. Environmental sustainability requires individuals to take actions that ensure future generations have access to the same or improved natural resources compared to the present [19]. Stakeholders, including consumers and employees, are increasingly aware of the significance of environmental sustainability [18] and expect manufacturing firms to integrate sustainability into their operations and policies [20, 18]. To gain support from these crucial stakeholders, manufacturing firms must adhere to regulations and policies that foster environmental sustainability. These stakeholders expect firms to provide functional value, emotional value, and societal value [16]. However, research in societal marketing indicates that most firms focus primarily on functional and emotional value, neglecting societal value [21,22,23,18]. This domain emphasizes that firms should act as responsible members of society, bearing social responsibilities for promoting social welfare [24,25].

Empirical evidence in the field of environmental sustainability suggests that businesses in the global market that do not support SDGs cannot meet the desired competitive advantage [9,10,26]. The Natural Resource-Based View (NRBV) supports this by suggesting that in order to achieve a competitive advantage, firms should engage in activities that provide environmentally friendly benefits like environmental protection through recycling [27]. When applied to marketing, NRBV is associated with a green marketing orientation, which entails integrating environmental sustainability considerations into all facets of marketing activities [20,28]. Regulations in some countries require firms to show their commitment to environmental sustainability before operating [9,10]. Environmental sustainability affects consumer behavior, which means that firms must consider it in their operations since consumers take it into account while making purchasing decisions [22,25]. Thus, manufacturing firms need to take into account aspects of environmental sustainability in their operations as they affect consumer buying behavior [29]. Consumers consider the environmental impact of products and tend to prefer brands that are environmentally conscious [30]. A global green buying report reveals that nowadays, about 67% of consumers are aware of environmental issues and about 54% takes into consideration the aspects of environmental sustainability including product packaging when making buying decisions [31]. Therefore, environmental sustainability is a pivotal concept for consumers, and businesses can apply in their value proposition [32]. To gain a competitive advantage, businesses should include environmental issues in their strategies and compliance with environmental standards in their value proposition [32,33].

Research in the environmental sustainability domain indicates that the limited progress in integrating environmental friendly practices into business strategies is primarily due to a lack of knowledge on environmental sustainability aspects [14]. Despite efforts to promote environmental sustainability in the service and manufacturing sectors, many business firms are still uncertain about how to effectively implement these practices in their operations [21,27]. This problem is especially critical in sub-Saharan countries, as their business models differ significantly from those of developed economies [34,35]. Investigating the antecedents of environmental sustainability in sub-Saharan countries is of great importance to enable manufacturing firms to build a competitive advantage in the global market [34]. [36] also emphasize that manufacturing firms need to understand the enablers of environmental sustainability in order to fully leverage its potential as a competitive advantage. Literature in societal marketing indicates that the adoption and positioning of delivering societal value as a strategic business strategy is not widespread among most manufacturing firms in the current marketplace [37,38]. Limited research has been conducted on the factors leading to environmental sustainability in business settings, particularly in developing economies, including sub-Saharan countries. Thus, there is a scarcity of studies examining the operational-based factors that enable environmental sustainability in the manufacturing sector [39,1,14]. Therefore, there is a need to understand marketing-related factors that enable environmental sustainability, especially in sub-Saharan countries.

Numerous studies indicate that green marketing-oriented strategies can enhance the environmental performance and competitive advantage of business firms [40,41,42,28]. For example [27], claims that an environmental marketing strategy significantly contributes to a firm's competitive advantage by promoting environmental sustainability practices. Similarly [42], found that a strategic and internal green marketing approach has a significant impact on environmental competitiveness. Both [42,27] underline the importance of better understanding the factors that affect environmental competitiveness in the business sector. Additionally [14], highlights the importance of considering employees and customers as key stakeholders in promoting environmental sustainability in small and medium-sized enterprises (SMEs). On the other hand [29], found an insignificant direct relationship between long-term orientation and emission reduction, but they found that green innovation and strategy mediate this relationship. Despite these studies, the literature still emphasizes the need to investigate drivers of environmental sustainability in the business sector [43,44]. This study aims to examine the effect of strategic green marketing orientation (SGMO) on environmental sustainability and introduces green absorptive capacity (GAC) as a moderator. To achieve this objective, the study addresses the RQ1, RQ2 and RQ3. GAC is defined

as the ability to comprehend, integrate, and apply environmental knowledge, and it is included as a moderator because previous research has shown its ability to strengthen the relationship between business strategies and eco-friendly outcomes [45,46,47,18]. Based on the NRBV, we suggest that SGMO which is characterized by long-term, top-management-led environmental policies may be crucial enabler of environmental sustainability when moderated by GAC. Additionally, we use the Knowledge-Based View (KBV) to propose that continual learning and knowledge acquisition determine adoption and implementation of GAC.

RQ1. Does SGMO significantly influence environmental sustainability?

RQ2. Does GAC significantly influence environmental sustainability?

RQ3. Does GAC significantly moderate the relationship between SGMO and environmental sustainability?

2. Literature review and hypotheses development

2.1. NRBV and KBV

The main argument of this study is that SGMO can positively impact environmental sustainability if SMEs enhance their GAC. Previous research has shown that absorptive capacity has various significant impacts when linked to strategic management practices in SMEs. For example [48], found that moderating entrepreneurial innovation with absorptive capacity leads to consumer purchasing behavior. The combination of absorptive capacity with other valuable, unique, and hard-to-imitate strategic resources can enhance an organization's ability to use knowledge for sustainability, as supported by the resource-based view, which suggests that firms with adequate internal strategic resources can achieve sustainable competitive advantage [49]. These resources, in the form of attributes, capabilities, and assets, can improve firm efficiency when effectively managed [50].

However, due to growing concerns about environmental issues in business, the resource-based view has been expanded to the NRBV, which explains how firms can interact with the natural environment to generate profits, improve social wellbeing, and be environmentally conscious. According to Ref. [50], for sustainable development to occur, firms should adopt the NRBV by practicing activities that provide environmentally friendly advantages, such as environmental protection through recycling. This implies that GAC can be a crucial factor in promoting environmental initiatives, particularly in helping an organization to acquire, assimilate, and transform environmental knowledge [51]. Hence, this study hypothesizes that environmental sustainability among SMEs can be enhanced when their practices are inclined towards being green, meaning that by enhancing GAC (which is adequately defined in KBV), SMEs can strengthen their SGMO for environmental sustainability.

On the other hand, KBV which is originally contributed by Ref. [52], is a theoretical paradigm used in the research domain of business and management to emphasize the role of knowledge and knowledge assets in achieving a sustainable competitive advantage. Therefore, this study adopts the KBV to provide insights into the importance of acquiring and leveraging knowledge about sustainable technologies, practices, and systems to build a competitive advantage. The study establishes a theoretical foundation that suggests manufacturing firms can develop and implement environmentally friendly strategies, such as reducing emissions and conserving resources, through continuous learning and innovation [53,54]. By employing the KBV, the study underscores the idea that knowledge acquisition, creation, and dissemination are crucial for achieving long-term environmental sustainability goals [55]. Additionally, this study suggests that GAC moderates the relationship between GAC and environmental sustainability. Previous studies have indicated that GAC is enhanced by knowledge-based influences [37,46,47]. Therefore, this study argues that, at a high level of GAC, the effect of SGMO on manufacturing firms' environmental sustainability is stronger than at a low level.

2.2. Institutional theory

This study utilizes institutional theory [15], to suggest that external influences play a crucial role in transforming and shaping organizational practices and actions. The theory is commonly employed in management and business research to provide valuable insights into the relationship between organizations and their environment, particularly regarding environmental sustainability [56]. The literature indicates that institutional theory primarily focuses on understanding the impact of institutional pressures, norms, and rules on shaping organizational behavior and practices [57]. According to institutional theorists, organizational behavior and practices are influenced by institutional forces, such as social structure, industrial structure, and market structure [58,59]. In practical terms, these institutional forces manifest as green orientations [60]. These forces can drive manufacturing firms to adopt sustainable practices, including the implementation of renewable energy sources, waste reduction, and the adoption of eco-friendly technologies, in order to meet societal expectations [58,61]. We employed this theory to propose that environmental sustainability is influenced by both formal regulations and informal norms pertaining to environmental stewardship. In this study, these considerations were regarded as part of GAC. Within the framework of institutional theory, the study further argues that in environmentally conscious societies, manufacturing firms should recognize their interdependence with the environment [58,60]. This highlights the significance of aligning organizational practices and actions with environmental concerns to ensure long-term environmental sustainability.

2.3. Understanding the concepts of SGMO, GAC, and environmental sustainability

2.3.1. SGMO

Marketing orientation appears to be a critical factor influencing the actions and performance of organizations, with the potential for

social consequences [62]. SGMO is one among the dimensions of green marketing orientation which adds to the other two, tactical and internal green marketing orientations [63]. SGMO can be defined as a green marketing orientation that focuses on top management's actions and policies centered on corporate environmental, proactive environmental strategies, and external environmental stakeholders [64,63,65]. SGMO is considered as an integrated orientation of green marketing, strategic orientation, marketing orientation, relationship marketing and social marketing [62]. In our study, we focus on SGMO as, adopting strategic orientation can lead to a sustainable competitive advantage, as it includes processes that help organizations meet needs, improve, and solidify themselves [66, 14]. Similarly, strategic green marketing can aid in environmental preservation, potentially leading to long-term sustainability [67]. SGMO can promote environmental sustainability by influencing an organization's interaction with the environment [63]. Thus, it can be argued that SGMO can lead to environmental sustainability in organizations because strategic orientation is linked to how organizations interact with the natural environment.

2.3.2. GAC

In general, absorptive capacity can be defined as an organization's ability to identify, assimilate, and exploit knowledge from its environment [68,69]. The concept of GAC entails the ability of an organization to recognize, incorporate, and apply external knowledge about environmental or green matters [51,70,18]. Due to its role in advancing environmental affairs, there is a body of literature that supports the impact of GAC on innovation and performance in a number of contexts. For instance, a study by Ref. [51] found that GAC impacts innovation performance and green organizational ambidexterity (exploration and exploitation learning). Similar to this [71,72], emphasize on the role of GAC on firm performance, and [73,74,75] present the role of GAC on innovation for companies. GAC has been viewed in this context as a crucial tool for boosting organizational innovation and overall performance. In a similar vein, increasing environmental competencies and capabilities for environmental sustainability may benefit organizations from increasing absorptive capacity [76].

2.3.3. Environmental sustainability

Despite the fact that there are numerous aspects related to the concept of sustainability, the majority of studies agreed on three major aspects: social, economic, and environmental aspects (triple bottom line) [77,78]. The focus of our study is on environmental sustainability because it is one of the sustainability aspects that is directly related to the natural environment and addresses the integration of businesses and natural environment. Simply put, environmental sustainability relates to placing an emphasis on the results of waste disposal, energy use, and resource consumption [78]. In the literature, environmental sustainability has received a lot of attention because it is critical to consider green initiatives for manufacturing firms and other business operations in addressing environmental concerns. For example [79], conducted a literature review from 2000 to 2020 to investigate the impact of Industry 4.0 on environmental sustainability. The findings revealed that integrating Industry 4.0 with sustainable development goals improves environmental sustainability by creating ecological support. When compared to previous approaches, this integration ensures better environmental performance and has a greater positive impact.

In addition to that [78], reported that lean manufacturing practices are crucial for environmental sustainability for manufacturing firms in Jordan. In another context [80], examined the connection between environmental sustainability and economic performance in agricultural-related practices in Sub-Saharan Africa. Their findings contended that value added activities in agriculture reduces emissions in the region. On the other hand, findings from the study conducted by Ref. [81] demonstrate that financial development improves ecological integrity and environmental sustainability in South Africa over the long and short term. In Tanzania [82], conducted a study in investigating environmental sustainability in public organizations and reported that functions and practices associated with green human resource management have a positive impact on promoting environmental sustainability. In contrast to previous research, our study takes a different approach to addressing environmental sustainability by relating it with two organizational factors (SGMO and GAC) and testing the moderating effect of GAC in the context of Tanzanian manufacturing SMEs.

2.4. Hypotheses development

2.4.1. SGMO and environmental sustainability

With SMEs showing an increasing interest in strategic practices, SGMO may be a useful tool for managers to manage their operations effectively while considering environmental concerns. A strand of previous studies has linked green marketing orientation and various non and environmentally-related outcomes such as business performance [83], competitive advantage [42], environmental performance [38] and green consumption intention [84]. However, there is little evidence that SGMO is connected to environmental sustainability, and even less is known about it in the context of sub-Saharan Africa. It should be noted that, SGMO comprises of several aspects such as meeting the green needs of the market and participation in green business networks [63], which are crucial for manufacturing and business-oriented firms. SGMO has been suggested to drive innovation and inspire the development of environmentally friendly products and services [42,83]. It encourages businesses to investigate alternative materials, manufacturing processes, and packaging solutions with low environmental impact [85]. With increasing interest of business models to incorporates aspects of eco-friendly practices [12], the relationship between SGMO and environmental sustainability worth investigating. Therefore, it is critical to investigate how a strategic approach to green marketing can promote environmental sustainability for manufacturing SMEs. Based on this discussion, it is reasonable to hypothesize that:

H1. SGMO positively and significantly relates to environmental sustainability.

2.4.2. GAC and environmental sustainability

GAC has been considered as a tool towards achieving innovation performance [51], firm performance [73,74] and boosting environmental managerial capabilities [76]. This is possible because, green knowledge, when absorbed and applied correctly, leads to improved resource development and transformation, resulting in new products that emphasize environmental conservation while also fulfilling organizational and customer needs. GAC may be a necessary driver of green activities such as product modification, repackaging and development of new green products [50]. It also has the potential to enhance the dissemination of environmental knowledge and thus decrease environmental problems [86]. Despite the numerous benefits associated with GAC, there is a paucity of research examining its relationship with environmental sustainability, particularly in the context of manufacturing SMEs. GAC is thought to be critical for organizations to effectively acquire and apply green knowledge, thereby contributing to environmental improvement [68,18]. Building on this discussion, it is worth to consider the following hypothesis:

H2. GAC positively and significantly relate to environmental sustainability.

2.4.3. The moderating role of GAC

Numerous studies have investigated the moderating effect of GAC on various variables related to eco-friendly practices in various contexts [69,46,47,18]. However, empirical evidence on the moderating role of GAC in the relationship between SGMO and environmental sustainability is still limited. The inclusion of GAC as a moderating variable in our study is based on the understanding that GAC is critical in enabling organizations to comprehend environmental knowledge, disseminate it, and integrate it into their business processes in order to achieve environmental sustainability [71,68,50]. Organizations that have GAC are better positioned to address environmental challenges, especially when combined with other critical environmental factors. In this context, manufacturing SMEs with a SGMO are more likely to improve their environmental sustainability if they have a strong foundation of GAC. This emphasizes the importance of these organizations to strengthen their green orientations as they strive to achieve the desired environmental sustainability outcomes. As a result, it is hypothesized that GAC improves an organization's ability to integrate environmentally friendly practices into their operations, thereby strengthening the influence of SGMO on environmental sustainability.

H3. GAC positively and significantly moderates the relationship between SGMO and environmental sustainability.

The conceptual framework that is operationalized in our study is depicted in Fig. 1. The framework was created using the previously mentioned hypotheses. It demonstrates the inclusion of SGMO as an exogenous variable, GAC as a moderating variable, and environmental sustainability as an endogenous variable. The moderating variable, GAC, has been included as a predicting variable in a statistical model so as to test our second hypothesis (H_2). Also, SGMO and GAC have been used to create an interaction term (SGMO*GAC) for testing the moderating effect of GAC on the relationship between SGMO and environmental sustainability (H_3). This was done after examining the influence of SGMO on environmental sustainability (H_1).

3. Research methodology

3.1. Research approach and design

This study used a quantitative research approach to establish relationships between the constructs under consideration using only quantitative data. We used quantitative data to analyze and interpret study's findings, focusing on numerical measurements and statistical analyses [87]. We applied a cross-sectional design, which meant that data was collected at a single point in time. Data was collected only once from manufacturing SMEs' managers operating in the fast-moving consumer goods industry. The cross-sectional design allowed the researchers to collect data on the variables of interest and examine their relationships over a specific time. Also, within business research, a quantitative approach is often preferred when researching in the context of manufacturing SMEs to quantify and evaluate the relationships between study's constructs [88,89]. This approach permits statistical analysis, hypothesis

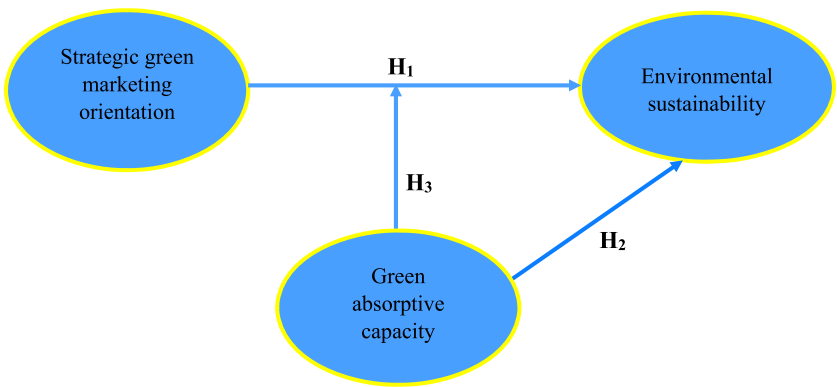

Fig. 1. The proposed model.

testing, and drawing inferences based on numerical evidence [87]. On the other hand, studies that address manufacturing SMEs have commonly used the cross-sectional design [39,90]. This design allows getting a snapshot of the relationships between variables at a specific point in time, allowing them to collect data more efficiently and assess the relationships between constructs [91]. This design is especially adequate in investigating relationships between variables in a specific context, such as the fast-moving consumer goods industry [14]. Thus, using a quantitative approach and cross-sectional design, we were able to investigate the link between SGMO and environmental sustainability in the context of manufacturing SMEs in Tanzania, as well as test the moderating effect of GAC on the relationship between SGMO and environmental sustainability.

3.2. Sampling and data collection

In the first place, two regions, Dodoma and Dar es salaam and three industries food and beverage, cleaning and toiletries, and cosmetics were purposefully selected. The selection was made on purpose due to reports indicating a high concentration of SMEs in these regions and their production of a diverse range of products, driven by the areas' growing population [92]. Furthermore, these industries were chosen because they are known for producing fast-moving consumer goods, which are particularly important when considering environmental concerns [93,14]. The researchers aimed to obtain a sample that was relevant and accurate for the study by purposefully choosing these regions and industries. However, a proportionate stratified sampling procedure was used within the selected industries (strata). This entailed selecting manufacturing SMEs and including a manager from each SME as the unit of inquiry. Managers were chosen because they are typically involved in critical and strategic decisions in their businesses, including those related to SGMO. Managers are regarded as the most relevant individuals in the Tanzanian context, as they possess the necessary information about their business operations [94,88,90].

The G*Power program was used to calculate the sample size for our study. Based on the desired effect size (f^2), number of predictors, level of significance, and statistical power, this program calculates the minimum required sample size [95,96]. Given $f^2 = 0.15$, $p = 0.05$, and statistical power $= 0.95$, the program recommended a sample size of 107 observations. It should be noted that our research concentrated on three industries, each with distinct characteristics in terms of the products they manufacture. We used a stratified proportionate sampling procedure to ensure that each industry was adequately represented in the final sample [87]. The objective of this approach was to generate a sample that could be considered to represent the entire population. We approached manufacturing SME managers in these industries and asked for their participation and willingness to fill out a structured questionnaire. To ensure an adequate response rate, we obtained consent from all potential respondents and distributed the questionnaire only to those who agreed. A self-administered survey questionnaire was used in the study, and it was administered using a drop-off/pick-up technique. During data collection, we obtained a total of 391 complete and useable questionnaires from manufacturing SMEs in Dodoma and Dar es Salaam regions. The final sample size was considered enough and achieved the desired statistical power as the post-hoc checking produced a statistical power of 0.99.

3.3. Measures

The three major constructs in this study were SGMO as an exogenous variable, GAC as a moderating variable, and environmental sustainability as an endogenous variable. All measurement items were obtained from previous studies, so the current study used validated scales from previous studies to measure the constructs. The construct "SGMO" was defined as the extent to which SMEs integrate environmental considerations into their strategic marketing decisions and was measured using nine items from Ref. [63]. A sample item from the measures of SGMO includes "*We invest in low-carbon technologies for our production processes*" as presented in Appendix 1. Also, GAC was defined as the ability of SMEs to acquire, assimilate, transform, and exploit environmental knowledge in their business practices and was measured using five items from Ref. [18]. A sample item includes "*My firm can effectively apply new external green knowledge to commercial demands*" (see Appendix 1). Lastly, environmental sustainability was defined as the capability and responsibility of SMEs to maintain the valued qualities of the physical environment now and in the future, and was measured using five items from Ref. [97]. One item that represents measures of environmental sustainability includes "*The firm implements water-saving practices*" as presented in Appendix 1. It should be noted that all the items in the main constructs of our study were measured in a five-point Likert scale ranging from 5 – Strongly agree to 1 – Strongly disagree.

3.4. Reliability and validity

This study took several steps to ensure reliability and validity. First, the study used validated measurements of the study's constructs from previous studies. Also, as opined by Ref. [87], a pilot study was also conducted before the full-scale data collection to ensure that the measurements were capable of measuring the intended constructs. The study assessed the reliability of the collected data using Cronbach's coefficient alpha (α) and construct reliability (CR), and both measures had values above 0.7. The study also assessed convergent and discriminant validity as forms of construct validity. Convergent validity was assessed by examining the average variance extracted (AVE) and factor loadings, and values of AVE were above 0.5 and factor loadings were above 0.7. Discriminant validity was assessed by examining cross loadings and the Heterotrait-monotrait (HTMT) ratio [98,99]. Since the study employed a Partial Least Squares-Structural Equation Modeling (PLS-SEM), the more specific results on reliability and validity are presented in the measurement model results in section 4.2.

3.5. Data analysis plan

The collected data were analyzed using PLS-SEM with the help of SmartPLS 4 software. This method of SEM is considered more robust in predicting relationships between variables (constructs) as it produces results for both the inner model and outer model [100]. In comparison to the covariance-based SEM, this technique is not restricted to data normality assumptions, making it applicable even with a small sample size [100,101]. We also used a PLS-SEM because it is more predictive in nature and also, assists to explain the predictive relationships between the study's constructs [102,100,103]. The analysis consisted of two steps. First, the measurement model was evaluated by confirming the main requirements for the examination of the structural model results. The results of this step provided important decisions regarding reliability using values of factor loadings, CR, alpha (α), and AVE for convergent validity as well as discriminant validity using cross loadings and the HTMT ratio. The second step involved evaluating the structural model, which was created after running the bootstrapping procedure with 5000 alterations and confidence intervals of 95%, to confirm the relationships between study constructs using statistical significance, path coefficient (β), collinearity, predictive power (R^2), f^2, and predictive relevance (Q^2). The main findings from these analysis procedures are presented in the results section.

3.6. Non-response bias and common method bias (CMB)

It should be noted that, non-response bias can occur when there are significant differences between people who responded early and those who responded late in the survey. Thus, in our study, we used a *t*-test and discovered no significant differences ($p > 0.05$) in the mean scores of the main constructs from respondents who responded early versus those who responded late [104]. On the other hand, CMB was assessed as the data were collected only once from a single source (manager) using a self-administered questionnaire. The Harman's single factor test was conducted and results showed that the single factor explained about 39.45% of the total variance [105]. Since this value was below 50%, the study concluded that the presence of CMB was not a significant concern. Furthermore, the collinearity test was assessed using Variance Inflation Factor (VIF) values in which all values were less than the threshold of 3.3 (SGMO = 1.419 and GAC = 1.419), and thus it was concluded that CMB was not a major concern [106].

4. Results

4.1. Demographic information of respondents

The demographic information of the respondents is displayed in Table 1. The results reveal that 253 (64.7%) managers were male and 138 (35.3%) were female, indicating that the majority of the respondents in this study were male. The table also indicates that 89 (22.8%) of the respondents were between the ages of 25 and 36, 204 (52.2%) were between the ages of 37 and 48, and 98 (25%) were of the age of 49 and above. Therefore, the majority of the surveyed manufacturing SMEs' managers were in the 37–48 age group. The sample was dominated by SMEs' managers with 7–9 years of experience (134, 34.3%). Furthermore, the majority of the respondents (282, 72.1%) held a college degree, suggesting that they have some understanding of environmental sustainability issues related to their operations. As previously mentioned, this study included three major types of industries, with the majority (163, 41.7%) being

Table 1
Demographic information of respondents.

Category	Response	Frequency	Percentage (%)
Sex			
	Female	138	35.3
	Male	253	64.7
Age (years)			
	25–36	89	22.8
	37–48	204	52.2
	49 and more	98	25.0
Level of education			
	Secondary level	109	27.9
	College level	282	72.1
Working experience (years)			
	1–3	89	22.8
	4–6	125	31.9
	7–9	134	34.3
	10 and more	43	11.0
Industry			
	Food and beverage	127	32.5
	Cleaning and toiletries	101	25.8
	Cosmetics	163	41.7
Number of employees			
	5–49	283	72.4
	50–99	108	27.6
Total		***391***	***100***

from the cosmetics industry, followed by the food and beverage industry (127, 32.5%) and cleaning and toiletries (101, 25.8%). Finally, the sample included manufacturing SMEs with 5–49 employees (284, 72.4%) and those with 50–99 employees (108, 27.6%).

4.2. Measurement model

The assessment of the measurement model was first done as outlined in the research methodology. The measurement model provided crucial results for evaluating the reliability and validity of the study. According to the guidelines by Ref. [100], the values of outer loadings should be above 0.708, CR values should be 0.7 or higher for adequate reliability, and AVE should be greater than 0.5. The results in Table 2 demonstrate that all these statistics are within the recommended thresholds. It should be noted that, literature still supports retaining the values of factor loadings when other items have higher loadings [89] and these values were above 0.7 [39, 107]. Therefore, convergent validity was established in this study as AVE values are above 0.5. Furthermore, the results in Table 3 indicate that discriminant validity was achieved as the values in the HTMT matrix as presented in Table 3 (correlations and HTMT test) are below the recommended threshold of 0.85 [100]. Lastly, the values of cross loadings (presented in Table 4) met the criteria, which state that an indicator should load higher on its own construct than on any other construct in the model [100,99], thereby verifying the achievement of validity in the study.

4.3. Structural model estimation for testing hypotheses

The second step of analysis involved the estimation of the structural model for testing the study's hypotheses. First, collinearity was assessed by using values of the VIF and the results show that collinearity did not pose an issue in this study as all values of VIF were below 3.3 [108,107]. Also, the results in this part show that all the developed hypotheses were accepted as p-value for each hypothesized relationship is less than 0.05 (see Table 5). Specifically, the results in this study support the findings that a positive and significant relationship exists between SGMO and environmental sustainability ($\beta = 0.244$, $t = 4.289$, $p < 0.001$). Furthermore, the results also show that GAC has a positive and significant relationship with environmental sustainability ($\beta = 0.412$, $t = 7.244$, $p < 0.001$). Additionally, GAC has a significant moderating effect on the relationship between SGMO and environmental sustainability ($\beta = 0.129$, $t = 2.403$, $p = 0.016$). These findings indicate the importance of GAC in strengthening the relationship between SGMO and environmental sustainability.

In addition, the value of $R^2 = 0.287$ (as presented in Fig. 2) indicates the predictive power of the structural model by revealing the amount of variance in the endogenous variable (environmental sustainability) that is contributed by the exogenous variables (SGMO and GAC). This means that 28.7% of the variation in the endogenous variable can be explained by the variables included in the model. According to Ref. [100], this R^2 value is considered low, as values of 0.25, 0.50, and 0.75 are interpreted as low, moderate, and substantial contributions, respectively. Moreover [109], states that f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effects. The results show f^2 values of 0.053, 0.161, and 0.046 for SGMO - > ENS, GAC - > ENS, and GAC x SGMO - > ENS, respectively. These statistics indicate that the effects of the exogenous variables on their respective endogenous variables are "*small*," "*medium*," and "*small*," if they were removed from the research model. Furthermore, the value of Stone-Geisser's (Q^2) = 0.250 was obtained after performing the blindfolding procedure. Since this value is greater than zero, it means that the exogenous variable has predictive relevance for the endogenous variable in the structural model [100].

Table 2
Measurement model assessment.

Construct and Items	Outer loadings	α	CR	AVE
Strategic green marketing orientation (SGMO)		*0.891*	*0.911*	*0.531*
SGMO1	0.733			
SGMO2	0.712			
SGMO3	0.742			
SGMO4	0.726			
SGMO5	0.713			
SGMO6	0.729			
SGMO7	0.729			
SGMO8	0.705			
SGMO9	0.768			
Green absorptive capacity (GAC)		*0.899*	*0.925*	*0.712*
GAC1	0.786			
GAC2	0.839			
GAC3	0.843			
GAC4	0.877			
GAC5	0.871			
Environmental sustainability (ENS)		*0.837*	*0.885*	*0.606*
ENS1	0.805			
ENS2	0.825			
ENS3	0.801			
ENS4	0.750			
ENS5	0.705			

Table 3
Correlations and HTMT test.

Inter-construct correlations				
Constructs		SGMO	GAC	ENS
SGMO		1		
GAC		0.543	1	
ENS		0.365	0.469	1
HTMT matrix				
Construct	**ENS**	**GAC**	**SGMO**	**GAC x SGMO**
ENS				
GAC	0.547			
SGMO	0.435	0.599		
GAC x SGMO	0.041	0.355	0.428	

Table 4
Cross loadings.

Constructs/Items	ENS	GAC	SGMO
ENS1	**0.805**	0.336	0.295
ENS2	**0.825**	0.449	0.295
ENS3	**0.801**	0.415	0.330
ENS4	**0.750**	0.320	0.318
ENS5	**0.705**	0.334	0.288
GAC1	0.382	**0.786**	0.443
GAC2	0.360	**0.839**	0.469
GAC3	0.386	**0.843**	0.507
GAC4	0.444	**0.877**	0.454
GAC5	0.446	**0.871**	0.490
SGMO1	0.292	0.485	**0.733**
SGMO2	0.275	0.492	**0.712**
SGMO3	0.342	0.467	**0.742**
SGMO4	0.388	0.530	**0.726**
SGMO5	0.230	0.323	**0.713**
SGMO6	0.198	0.249	**0.729**
SGMO7	0.265	0.307	**0.729**
SGMO8	0.219	0.350	**0.705**
SGMO9	0.261	0.321	**0.768**

Note(s): Cross-loadings are indicated by bolded values (an item loads more on its own construct than on any other construct in the model).

Table 5
Hypotheses testing.

Hypotheses	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	f^2	p values
SGMO - > ENS	0.244	0.250	0.057	4.289	0.053	0.000
GAC - > ENS	0.412	0.412	0.057	7.244	0.161	0.000
GAC x SGMO - > ENS	0.129	0.123	0.054	2.403	0.046	0.016

The findings depicted in Fig. 3 reveal the moderating effect of GAC on the relationship between SGMO and environmental sustainability. The graph illustrates the impact of SGMO on environmental sustainability, considering varying levels of GAC. The results suggest that GAC operates as a positive moderator, strengthening the relationship between SGMO and environmental sustainability. When GAC is high, the effect of SGMO on environmental sustainability becomes stronger compared to when GAC is low. This indicates that GAC strengthens the positive relationship between SGMO and environmental sustainability for manufacturing SMEs in Tanzania.

5. Discussion

To address the RQ1, RQ2 and RQ3, the study aimed to investigate the influence of SGMO and GAC on environmental sustainability, and to examine the moderating effect of GAC on the relationship between SGMO and environmental sustainability. Three primary hypotheses were developed, and based on the main findings, the current study successfully confirmed all of them. First and foremost, the results show that SGMO has a significant and positive effect on environmental sustainability. These findings imply that SGMO is an important determinant of environmental sustainability for the manufacturing SMEs in Tanzania. Our results are in support with those reported by Refs. [38,42]. It is clear that previous research has shown that green marketing orientation has an effect on environmental

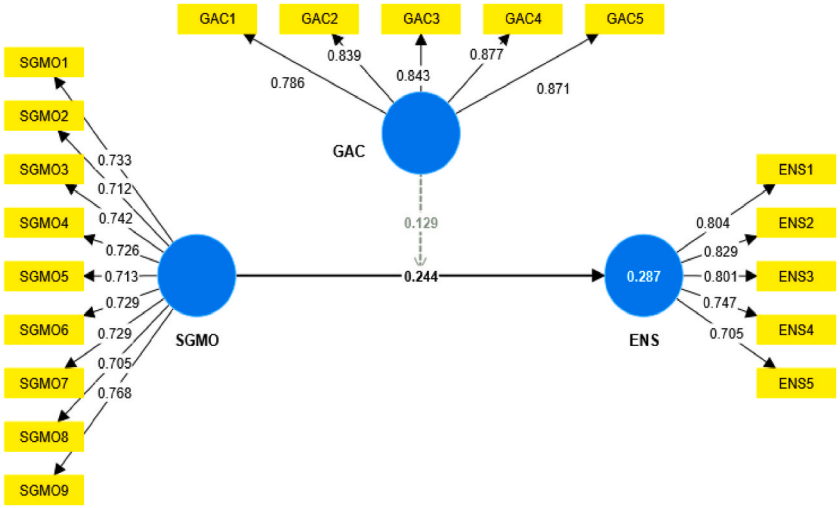

Fig. 2. The structural model.

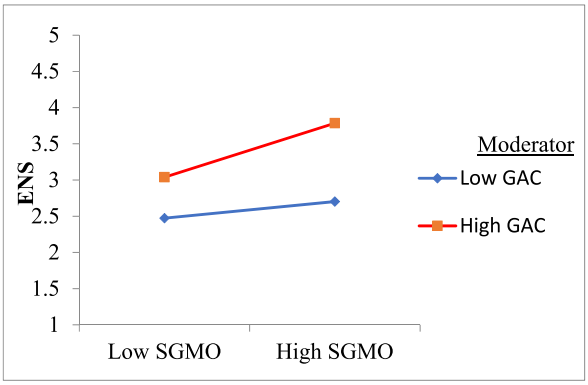

Fig. 3. The moderating effect of GAC.

performance [38], competitive advantage [42] and general business performance [83]. However, more research is needed to provide empirical evidence on SGMO and environmental sustainability from the perspective of manufacturing SMEs in sub-Saharan Africa. Therefore, our study extends the available literature by focusing on the influence of SGMO on environmental sustainability in the context of manufacturing SMEs in Tanzania.

Second, on explaining the environmental sustainability, our study showed that GAC has a significant impact on environmental sustainability. This confirms the second hypothesis of the study and hence, GAC is considered to be a crucial determinant of environmental sustainability for the surveyed manufacturing SMEs. The positive influence of GAC on environmental sustainability can be contributed by its ability to help manufacturing SMEs effectively use green knowledge in their operations which lead to more sustainable outcomes for the environment. Our results concur with those of [110,111], suggesting that absorptive capacity is indeed connected to a number of environmentally friendly outcomes. Similarly, there is a substantial body of literature on the role of GAC in various contexts. For example [71], establishes the link between GAC and firm performance in electronics industry in Taiwan and [72] establishes on GAC and firm performance for manufacturing firms in China. Also, GAC is related to green innovation in hotels and restaurants in China [74,50], SMEs' green innovation adoption in Egypt [73], green service innovation and green dynamic capabilities in the context of Brazilian universities [112]. Contrary to the aforementioned studies, a study by Ref. [69] in the mediation-moderated model found that while GAC was not found to be a significant predictor of green innovation performance, it did show a strong relationship with organizational factors among firms in the Brazilian electric power industry. Therefore, our study adds to the existing body of literature by providing empirical evidence of the role of GAC in promoting environmental sustainability for manufacturing SMEs in Tanzania.

Lastly, this study highlights the moderating role of GAC in the relationship between SGMO and environmental sustainability. The results show that GAC is a positive and significant moderator, thereby strengthening the positive impact of SGMO on environmental sustainability. The findings suggest that manufacturing SMEs with high levels of GAC are more likely to effectively integrate new external green knowledge into their operations, leading to greater environmental sustainability through reduced solid waste, liquid

waste, and emissions. On the other hand, SMEs with low levels of GAC may not have the same ability to integrate new green knowledge, thereby limiting the impact of SGMO on environmental sustainability. Hence, the influence of SGMO on environmental sustainability varies based on the levels of GAC. Studies that examined and confirmed the moderating role of GAC in various situations are consistent with our findings. For instance, a study by Ref. [18] which was conducted in mining enterprises found that GAC is a positive moderator of green strategic orientation and green innovation [46]. found a positive moderating effect of GAC on green entrepreneurial orientation and knowledge creation process while [47] reported a significant moderating role of GAC on market-based regulation and external knowledge adoption in Chinese manufacturing firms. Furthermore, from a sampled firms in Brazilian electric power industry [69], found a positive moderating effect of GAC on the mediation model which included green innovation performance as an outcome variable, organizational factors as a mediator and environmental factors as independent variables. Despite these studies, our results provide unique insights into how GAC strengthens the effect of SGMO on environmental sustainability on the context of manufacturing SMEs in Tanzania.

6. Conclusions, study's implications and limitations

6.1. Conclusions

This study utilizes the institutional theory, NRBV and KBV to demonstrate the significance of SGMO and GAC in promoting environmental sustainability. The findings reveal that GAC amplifies the impact of SGMO on environmental sustainability. SMEs with a high level of GAC are more in better chance to adopt sustainable practices than those with a low level of GAC. The study highlights the importance of equipping manufacturing SMEs with the ability to acquire new green knowledge and integrate it into their operations to achieve environmental sustainability. This research not only sheds light on the environmental concerns of SMEs in developing economies like Tanzania but also underscores the role of SGMO and GAC in ensuring environmental sustainability. Our study provides valuable insights for managers, policymakers, and academics interested in sustainability, particularly the environmental sustainability in developing economies.

6.2. Theoretical implications

With an increasing rate of environmental concerns around the globe, this study contributes to the existing literature by examining the impact of SGMO and GAC on environmental sustainability in sub-Saharan countries, with a focus on Tanzania. The study also explores the moderating role of GAC in the relationship between SGMO and environmental sustainability. This study has a general theoretical contribution of extending the existing studies that address environmental concerns from various perspectives [97,113,50, 86,28]. Our specific contribution is to broaden understanding of the role of green marketing orientation in different settings. Existing studies have presented the role of green marketing orientation on several outcomes such as new product success [32], green image and loyalty [114], green consumption intention [84], competitive advantage [42], and business performance [115,83]. In this regard, few studies have looked into the relationship between SGMO and its ability to explain environmental sustainability, particularly in developing economies. Our study extends the existing literature by providing empirical evidence on the role of SGMO and GAC on explaining environmental sustainability from Tanzania.

This research utilizes institutional theory, NRBV, and KBV to conduct an empirical examination of the model pertaining to the effect of SGMO on environmental sustainability. The present study also investigates the role of GAC in moderating the relationship between SGMO and environmental sustainability. Prior research has demonstrated that a green marketing orientation has a notable effect on sustainable performance and plays a crucial role in determining eco-friendly-related outcomes [114,84]. Furthermore, GAC has been linked to improvements in environmental knowledge [86] and green product-related accomplishments such as modification and repackaging [50]. However, previous empirical literature has overlooked the influence of SGMO on environmental sustainability, nor has it explored the moderating role of GAC. Hence, our findings expand the current understanding by signifying that SGMO has a direct impact on environmental sustainability, while the level of GAC contributes to explaining the effects of SGMO on the environment. At a high level of GAC, the effect of SGMO on environmental sustainability becomes stronger in comparison to a low level of GAC. Therefore, our results offer significant contribution on explaining conditions under which SMEs can effectively utilize SGMO and GAC to enhance their environmental sustainability.

6.3. Practical implications

This study has several implications for managerial practices, policy, and sustainability. The findings demonstrate that both SGMO and GAC have a significant impact on influencing environmental sustainability. Moreover, GAC strengthens the relationship between SGMO and environmental sustainability for manufacturing SMEs in Tanzania. This suggests that manufacturing SMEs should give both of these factors a needed consideration in their efforts to increase environmental sustainability. Businesses' managers should put their efforts into integrating SGMO, including training and educating their staff about eco-friendly practices when they are focusing on meeting customers' requirements. SMEs should also work to develop new green knowledge and skills for their employees in order to enhance their GAC. The study's findings demonstrate the significance of taking into account both SGMO and GAC in the quest for environmental sustainability. This provides a valuable foundation for SMEs to leverage these intangible resources to enhance their environmental sustainability.

Also, our study has some policy implications for governments of sub-Saharan African countries including Tanzania (where this

study was conducted). The study highlights the need for these governments to ensure that there is an effective implementation of considerations related to eco-friendly practices for the registration of SMEs. This is necessary to ensure that SMEs are aware and capable on addressing environmental concerns in their business undertakings. Furthermore, the implementation of industrial policies should go together with the efforts of enhancing eco-friendly practices in a sustainable manner. This could be further emphasized for manufacturing-oriented firms which are major potential pollutants due to the nature of their operations. Thus, green technologies and eco-friendly practices could be encouraged by governments through their respective authorities. On the other hand, the study provides a stepping stone for the government of Tanzania to meet the SDGs 11 and 12. These goals aim to "make cities and human settlements inclusive, safe, resilient, and sustainable" and "ensure sustainable consumption and production patterns" respectively. The study's findings highlight the importance of green practices and environmental sustainability for manufacturing SMEs in achieving these SDGs. By promoting sustainability in their practices, SMEs can reduce their emissions and waste, which will ultimately lead to a more sustainable environment. The study emphasizes the positive impact of SGMO and GAC on environmental sustainability, and particularly highlights the role of GAC in strengthening the influence of SGMO on sustainable environment.

6.4. Limitations

The study has several limitations that warrant further research, despite its contributions to the theory and practice. First, based on the literature review, this study only focused on SGMO as one of the determinants of green marketing orientation. Future research can expand on this by incorporating other dimensions of green marketing orientation such as tactical and internal green marketing orientation [63]. Additionally, future studies could also consider different types of industries, and inclusion of other dimensions of sustainability as opined by Ref. [78], so as to extend our current study which focused solely on the environmental sustainability. These studies could be conducted in Tanzania or other countries, contributing to a deeper understanding of environmental sustainability. Lastly, this study used GAC as a moderating variable in the relationship between SGMO and environmental sustainability. Future studies can explore other moderating variables such as managerial competencies to determine if the influence of SGMO on environmental sustainability varies based on the level of managerial competencies. Such future efforts could expand the findings of this study and enhance our understanding of environmental sustainability.

Author contribution statement

All authors listed have significantly contributed to the development and the writing of this article.

Data availability statement

Data will be made available on request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e18373.

Appendix 1Measurement items

Constructs/Items
Strategic green marketing orientation (SGMO)
- We invest in low-carbon technologies for our production processes (SGMO1).
- We use specific environmental policy for selecting our partners (SGMO2).
- We use specific environmental policy for selecting our partners (SGMO3).
- We make efforts to use renewable energy sources for our products/services (SGMO4).
- We have created a separate department/unit specializing in environmental issues for our organization (SGMO5).
- We participate in environmental business networks (SGMO6).
- We engage in dialogue with our stakeholders about environmental aspect of our organization (SGMO7).
- We implement market research to detect green needs in the marketplace (SGMO8).
- Among other target markets, we also target to environmentally-conscious consumers (SGMO9).
Green absorptive capacity (GAC)
- My firm can effectively apply new external green knowledge to commercial demands (GAC1).

(*continued on next page*)

(*continued*)

Constructs/Items
- My firm can identify and acquire important new and useful external green knowledge (GAC2).
- My firm can integrate existing green knowledge with new green knowledge (GAC3).
- My firm can absorb and store new green knowledge (GAC4).
- My firm can encourage employees to master and use new green knowledge in operations (GAC5).
Environmental sustainability (ENS)
- The firm implements water-saving practices (ENS1).
- The firm implements energy-saving practices (ENS2).
- The firm adopts practices to reduce emissions (ENS3).
- The firm adopts practices to reduce solid waste (ENS4).
- The firm adopts practices to reduce liquid waste (ENS5).

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