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Article

Evaluating Sustainable Practices and Supply Chain Management Effectiveness in African Small and Medium-Sized Enterprises (SMEs)

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ABSTRACT

Objective: This study seeks to analyse the viability and competitiveness of African small and medium-sized enterprises (SMEs) by exploring the potential of sustainable practices and supply chain management (SCM) strategies. It focuses on the important need to quantitatively evaluate the effects of sustainability on the operational and strategic outcomes of African SMEs in various economic contexts.

Approach: This study utilises a rigorous quantitative analysis and a cross-sectional survey design to gather data from SMEs in fourteen African countries. An analysis using structural equation modelling (SEM) was conducted to examine the relationship between sustainable practices, supply chain management (SCM) strategies, stakeholder support, and the competitiveness of SMEs.

Findings: The study's results suggest that implementing sustainable practices can greatly improve the competitiveness of small and medium-sized enterprises and the effectiveness of SCM. Incorporating sustainability into SCM strategies enhances operational efficiencies and contributes to resilience and strategic market positioning. Stakeholder support is crucial in ensuring the successful adoption of sustainability practices. Furthermore, the research illustrates that internal capabilities and strategic alignment with sustainability are key factors in determining long-term viability and gaining a competitive edge.

Originality/Contribution: This research adds to the existing body of knowledge by presenting empirical evidence on the strategic advantages of sustainability in resource-constrained settings, such as African SMEs. It goes beyond the traditional focus on cost savings and operational efficiencies. This research builds upon established theories like the Resource-Based View and Stakeholder Theory but applies them specifically to African SMEs. Doing so provides a deeper understanding of how sustainability can be used as a competitive advantage in emerging markets. The study's thorough analysis across various African regions offers various viewpoints, strengthening the findings' relevance and usefulness for other developing economies.

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INTRODUCTION

Small and medium-sized enterprises (SMEs) play a crucial role in Africa's economy, significantly impacting employment rates and gross domestic product. According to the African Development Bank [1] SMEs account for over 90% of businesses and contribute more than 50% of employment and GDP in most African countries. For example, in Nigeria, SMEs contribute approximately 48% of the national GDP and employ about 84% of the workforce, while in South Africa, they contribute around 34% of GDP and provide 60% of employment. Although SMEs play a crucial role, they face difficulties integrating sustainable practices into their operations, which is vital for long-term survival and competitiveness. Integrating sustainability into SMEs is crucial for preserving the environment, improving business performance, and promoting societal well-being. These efforts align with the Sustainable Development Goals (SDGs) set by the United Nations Development Programme [2–4].

The literature highlights the importance of effective supply chain management (SCM) in African SMEs to reduce waste, operational costs, and improve customer satisfaction. Sequentially, this strengthens competitiveness and sustainability [5,6]. For instance, Adeniran et al. [2] indicate that effective SCM can reduce operational costs by up to 20%, leading to significant improvements in profit margins for SMEs. Embracing sustainability practices has become of utmost importance for businesses globally, particularly for SMEs, as they greatly improve resilience and competitiveness [7]. Mnyakin [8] suggests that sustainable practices can enhance business resilience by 30% and competitiveness by 25%, underscoring their critical role in business strategy. Nevertheless, implementing sustainable SCM practices faces obstacles like insufficient infrastructure and limited stakeholder collaboration, exacerbated by systemic challenges such as unpredictable political climates and regulatory deficiencies [9]. For example, infrastructure deficits and political instability in Nigeria and Ethiopia significantly hinder the integration of sustainable SCM practices [10]. Although sustainability is widely acknowledged as important, there is a noticeable lack of understanding regarding its implementation in African SMEs. This gap is partly due to African SMEs' unique challenges, such as fragmented markets, limited access to technology, and varying regulatory environments [11]. Existing research primarily concentrates on larger corporations or SMEs in developed countries, overlooking African SMEs' distinct challenges and possibilities [12]. This oversight leads to a one-size-fits-all approach that fails to address the specific needs of African SMEs. For instance, studies from developed countries often assume the

availability of advanced technologies and stable regulatory frameworks, which are not always present in African contexts [13]. This gap in the literature has been highlighted by Alberts and Naude [10], Awuah, Amoako, and Ahmed [11], and Kibwage, Wanjiru, and Waititu [12]. These authors emphasise the need for region-specific research considering African countries' socio-economic and political realities.

Moreover, there is a critical gap in quantitative data that can provide a comprehensive understanding of sustainable SCM practices' impact on African SMEs' competitiveness. While qualitative studies offer valuable insights, they often lack the empirical data to make generalisable conclusions [14]. Highlighted by recent studies [12,15], the importance of sustainable practices is accentuated but lacks extensive quantitative evidence [16]. This emphasises the need for thorough and long-term studies to fill this critical gap in knowledge [8,9]. In addition, there is insufficient exploration of the role of stakeholder dynamics in implementing sustainable SCM in African SMEs. The interaction between stakeholders—suppliers, customers, and regulatory bodies—is crucial in successfully adopting sustainability practices. However, this aspect is often under-researched, leading to an incomplete understanding of the challenges and opportunities in this area [17]. Another significant gap is the lack of focus on Africa's varied economic, cultural, and regulatory environments. Research often fails to account for the diversity within the continent, resulting in a narrow perspective that does not adequately represent regions like North Africa and rural areas [18]. For example, the regulatory environment in South Africa is vastly different from that in Chad or Tunisia, yet these differences are frequently overlooked in the literature [10]. To address these gaps, there is a pressing need for comprehensive, data-driven studies that examine the unique challenges and opportunities for sustainable SCM in African SMEs, gathering quantitative data, exploring stakeholder dynamics, and considering the diverse economic and regulatory contexts within the continent [9].

This study aims to fill these gaps by employing quantitative data analysis to examine sustainable practices and supply chain strategies in African SMEs. Expanding the geographical scope to include various regions across Africa, such as Benin, Cameroon, Chad, Egypt, Ethiopia, Ghana, Morocco, Niger, Nigeria, South Africa, Togo, Tunisia, Uganda, and Zimbabwe, to provide a comprehensive understanding of the dynamics of SMEs on the continent. This study aims to offer valuable empirical insights while adopting a comprehensive approach to examine the relationship between sustainability practices and competitive advantages in small and medium-sized enterprise (SME) supply chains. It provides practical insights and data-driven strategies to improve the integration of sustainability. This study seeks to significantly contribute to understanding sustainability practices in African SMEs by addressing these gaps. It aims to provide valuable insights for decision-making and promote sustainable economic development.

Following the introduction, the structure of this paper is outlined as follows. Section 2 (LITERATURE REVIEW) presents a comprehensive literature review, delving into the theoretical frameworks that underpin this study and exploring existing research on sustainability practices and the competitiveness of African SMEs. Section 3 (RESEARCH METHODOLOGY) details the research methodology, explaining the quantitative framework employed, the cross-sectional survey design, and the data analysis techniques used, including structural equation modelling (SEM). The section also elaborates on developing measurement instruments and the steps taken to ensure data validity and reliability. Section 4 (OVERVIEW OF RESULTS) presents the results, including descriptive statistics and the outcomes of the SEM analysis, which examine the relationships between sustainability practices, SCM strategies, stakeholder support, and SME competitiveness. Section 5 (DISCUSSION OF FINDINGS) discusses the findings, linking them to the existing literature and theoretical frameworks and emphasising the practical implications for SMEs and policymakers. Finally, Section 6 (CONCLUSION) concludes the paper by summarising the key insights, discussing the study's limitations, and suggesting avenues for further research to enhance the understanding of sustainability practices in African SMEs.

LITERATURE REVIEW

The literature review in this paper is structured into four subsections to provide a comprehensive examination of the theoretical and empirical foundations relevant to sustainable SCM in African SMEs. The rationale behind this division is to systematically address the multifaceted aspects of sustainability and its impact on SME competitiveness, ensuring a thorough understanding of the subject. The first subsection, “Theoretical Framework”, explores key theories such as Porter’s Theory of Competitive Advantage, the Resource-Based View (RBV), and Stakeholder Theory. This provides a robust theoretical foundation for understanding how SMEs can leverage sustainability for competitive advantage. This section highlights how these theories apply to the unique context of African SMEs, considering the specific economic and regulatory environments they operate within. The second subsection, “Sustainability Practices in SMEs”, reviews the existing literature on adopting and implementing sustainability practices in SMEs, focusing on their benefits and challenges. This explores various empirical research that illustrates the practical implications of sustainability on SME performance and resilience. The third subsection, “Supply Chain Management Strategies”, examines the role of effective SCM strategies in enhancing the sustainability and competitiveness of SMEs. It discusses the importance of reducing waste, improving operational efficiencies, and fostering collaboration among stakeholders, supported by empirical data and case studies from different African countries. The fourth subsection highlights the insufficient

exploration of stakeholder dynamics and Africa's diverse economic, cultural, and regulatory environments.

Theoretical Framework

SMEs in Africa are crucial in fostering economic growth [19,20]. Nevertheless, the incorporation of sustainable practices and efficient SCM strategies, which play a vital role in modern business strategy that seeks to balance economic growth with environmental and social well-being, continues to be a significant hurdle for African SMEs [21–24]. The challenges in integrating sustainability and optimising supply chains poses a significant risk to businesses' long-term survival and competitiveness. Therefore, conducting a thorough examination to tackle these issues effectively is crucial.

Porter's Theory of Competitive Advantage explains that organisations can achieve long-lasting competitive advantages by implementing strategies that set them apart from their competitors [25]. When considering African SMEs in highly competitive markets, it is important to analyse their strategic positioning. Porter's framework is valuable for this, as it highlights the importance of sustainability as a key factor in setting them apart from their competitors. Integration of sustainable practices into their operations, SMEs can strengthen their competitive advantage, seizing niche markets and opportunities for higher pricing. This alignms with environmental and social governance (ESG) standards to reflect the growing importance of these factors to customers and the potential cost savings it can bring, which is crucial for Porter's cost leadership strategy. The Resource-Based View (RBV) theory, a fundamental concept in strategic management, posits that a company's internal capabilities and resources are crucial in determining its long-term competitive advantages. In African SMEs, which frequently operate in environments with limited resources, effectively utilising and managing tangible and intangible resources is paramount. RBV offers valuable insights into how these SMEs can utilise their current resources to drive innovation and effectively compete, thereby improving their long-term sustainability and competitiveness.

Nevertheless, implementing these theories in African SMEs necessitates careful examination of the broader socioeconomic and institutional context. Stakeholder theory enhances RBV by recognising the significance of external influences and stakeholder relationships on organisational behaviour and resource acquisition. Comprehending the interplay between internal resource allocations and external environmental factors is crucial for successful resource management and strategic capability development in African SMEs. This understanding is essential for a well-rounded approach to economic growth, ecological stewardship, and social well-being [23,24]. Although implementing sustainable practices in African SMEs faces several challenges, such as regulatory constraints and market conditions, there is opportunities for

improvement. To successfully navigate the complexities of sustainability integration, it is crucial to have a comprehensive framework that considers governmental regulations, technological availability, and societal emphasis on sustainability. This will enable SMEs to overcome the challenges they face in this area.

Thus, the combination of Porter's Theory of Competitive Advantage, RBV, and Stakeholder Theory forms the basis of this study, providing a strong theoretical framework for understanding the obstacles and possibilities that African SMEs encounter when implementing sustainable practices and improving supply chains. By integrating various theories and carefully considering the specific contextual factors in the African business landscape, this study offers practical insights to help SMEs improve their long-term sustainability and competitive edge.

Sustainability Practices and The Competitiveness of African SMEs

Embracing sustainability practices has become an essential requirement for businesses around the globe, especially for SMEs in light of growing environmental concerns and ongoing social inequalities [6]. In Africa, SMEs are crucial when driving economic growth and social development, face growing pressure to incorporate sustainability principles into their operational frameworks. Sustainability practices encompass various measures that address environmental concerns, promote social responsibility, and ensure economic viability [14,26]. These initiatives encompass energy efficiency enhancements, waste reduction protocols, responsible sourcing, community engagement, and ethical labour standards [27]. Amid a growing body of research, it is becoming increasingly clear that adopting sustainable practices can have a transformative impact on SMEs. This can result in tangible benefits such as cost savings, improved resource utilisation, stronger brand reputation, and increased market reach. These findings are supported by studies conducted by Mnyakin [8] and Shahzadi et al. [9]. Moreover, adopting sustainability practices can significantly enhance supply chain resilience and efficiency [27]. In addition, research highlights the importance of sustainability in promoting innovation and cultivating employee dedication, contributing to long-term growth and organisational resilience [28]. Incorporating multi-criteria decision-making techniques for green logistics and low-carbon transportation systems has also been identified as a critical component of sustainable practices [29]. Therefore, it is essential to prioritise the development of strategic frameworks that enable SMEs to stand out, foster innovation, and adjust to ever-changing market conditions [30,31].

Nevertheless, SMEs in the African context face significant challenges regarding sustainability. These challenges include gaps in knowledge, limited resources, and inadequate support infrastructure [17,18]. Despite the obstacles faced, there is an increasing recognition of the crucial role of sustainability in Africa's developmental agenda. Governments,

international organisations, and civil society actors actively promote sustainable business practices to support inclusive and sustainable economic growth [32]. Despite this, there is a lack of extensive research on sustainability practices and SME competitiveness in Africa. Many studies prioritise larger enterprises and neglect African SMEs' unique obstacles and possibilities [13].

As a result, there is a significant lack of empirical research that examines how sustainable practices affect the competitiveness of African SMEs in various contexts. Further empirical inquiry is needed to identify the specific characteristics that shape the adoption and efficacy of sustainable practices in African SMEs. It is crucial to conduct further research to determine whether adopting sustainability practices leads to increased competitiveness among African SMEs. This study aims to fill a gap in research by examining the hypothesis that adopting sustainability practices positively impacts the competitiveness of SMEs in Africa. This research delves into the intricate dynamics of sustainability adoption in African SMEs using rigorous empirical inquiry. It aims to enhance the understanding of the relationship between sustainability practices and SME competitiveness by assessing the hypothesis: $H1_{(a)}$: The adoption of sustainability practices positively influences the competitiveness of SMEs in Africa.

Sustainability Practices and Supply Chain Management Strategies in African SMEs

Sustainability practices within SMEs supply chains are crucial in promoting sustainable economic growth while addressing poverty and inequality in Africa [33]. The importance of supply chains cannot be emphasised enough. They serve as the backbone of the global economy, connecting producers, suppliers, manufacturers, and consumers [34]. African supply chains connect rural communities with larger economic networks. Through the adoption of sustainable practices, companies can reduce their impact on the environment, support equitable working conditions, and play a role in fostering sustainable development across the continent [35].

Effective SCM is crucial for SMEs to enhance operational efficiency, reduce costs, and meet customer demands. SCM involves managing and coordinating interconnected businesses that provide goods and services to customers. This involves the process of sourcing, procurement, conversion, and logistics management, which requires working with channel partners like suppliers, intermediaries, service providers, and customers [30,31]. Nevertheless, SMEs in Africa face distinct challenges in SCM, such as insufficient infrastructure, fragmented markets, and limited technology adoption [36]. Nevertheless, incorporating sustainability practices into SME supply chain operations offers many advantages. These include reducing costs, mitigating risks, and creating value, as highlighted by Mnyakin [8] and Shahzadi et al. [9]. Strategies like lean manufacturing

and green procurement have effectively reduced carbon emissions while improving operational efficiency and resilience [15]. In addition, ethical labour standards and responsible procurement practices contribute to social responsibility, strengthen supplier relationships, and reduce reputational risks [37].

Due to the limited research, it is important to note the lack of empirical studies on the relationship between sustainability practices and SCM strategies in African SMEs [13]. Kosasih et al. [15] highlighted the significance of waste reduction and resource optimisation strategies, especially in African SMEs where resources are limited, and waste can have substantial financial consequences. In addition, various challenges, such as economic and legal constraints, hinder the implementation of sustainable SCM strategies. Overcoming these obstacles requires implementing supportive policies and frameworks, as highlighted by Setyaningsih et al. [13]. Cultural and structural factors play a significant role in shaping the development of SCM strategy. Many corporate cultures tend to prioritise short-term economic gains at the expense of long-term sustainability, which can impede the adoption of sustainable practices. In certain African regions, implementing effective SCM solutions is hindered by infrastructural and logistical challenges. However, there is significant potential to improve sustainability by implementing innovative SCM solutions. Considering the importance of sustainability in SCM strategies for African SMEs, there is a potential to improve operational efficiency and establish a foundation for long-term success and stability. Nevertheless, further investigation is required to explore the practical implementation of sustainability within the SCM strategies of African SMEs and the effects on their day-to-day activities. Based on the available empirical evidence and the gaps in current research, it can be hypothesised that $H2_{(a)}$: Integrating sustainability practices into operations significantly influences supply chain management strategies of small and medium-sized enterprises (SMEs) in Africa.

Stakeholder Support and Sustainability Practices in SME Supply Chains

Stakeholder theory proposes that an organisation's practices and strategy are influenced by the values and goals of various stakeholders [38]. Various stakeholders in African SMEs play a crucial role in shaping business practices and promoting sustainability. These parties include suppliers, customers, local communities, governments, and financial institutions, all of whom profoundly impact the development of SMEs [39,40]. Stakeholder support is essential for SMEs to overcome resource limitations and integrate sustainability into their supply chains. SMEs can successfully implement sustainable practices by receiving financial backing, information sharing, and regulatory support from stakeholders [41,42]. Prior research highlights the importance of stakeholders when assisting SMEs in overcoming challenges related to sustainability,

including high costs and lack of expertise [43]. It is crucial to address the challenges African SMEs face, which are hindered by limited resources and inadequate infrastructure [44]. The issues at hand pose significant obstacles to the smooth functioning of day-to-day activities and hinder the adoption of sustainable practices. As a result, stakeholder buy-in becomes even more crucial [34]. Collaborative efforts among stakeholders can lead to innovative solutions that address environmental and economic concerns, promoting a comprehensive approach to sustainability [45,46]. Nevertheless, a major challenge SME supply chains face in Africa is the lack of stakeholder collaboration [47,48]. This can lead to inefficiencies, such as duplicated efforts and a lack of resource utilisation coordination [34]. In addition, stakeholders often face challenges building trust, hindering information sharing and forming collaborative partnerships [49]. As Kramer and Erb [50] noted, supply chains information asymmetry in Africa presents significant obstacles for companies seeking to assess their supply chain sustainability and customers aiming to make informed purchasing decisions. These factors may hinder SMEs from effectively implementing sustainability practices in their supply chains, requiring careful thought and consideration. After careful analysis of the insights and empirical evidence, it is hypothesised that:

$H3_{(a)}$: The integration of sustainability practices within SME supply chains in Africa significantly impacts the level of stakeholder support.

RESEARCH METHODOLOGY

This research utilises a well-established quantitative framework to investigate sustainability practices within SMEs across diverse economic landscapes in Africa. Drawn from the research methodology proposed by Creswell and Creswell [51], this study adopts a survey-based approach, employing a meticulously designed questionnaire to facilitate thorough data collection from a specific demographic. This methodology fosters a sense of trust in the credibility and accuracy of our findings.

The study utilises a cross-sectional survey design, which entails gathering data from a population at a particular time. This design is suitable for addressing the research questions in the study, which aim to identify and analyse sustainability practices in SMEs' supply chains across different African nations. By collecting data from a wide array of SMEs across various countries, we can comprehensively understand the present condition of sustainability practices within African SMEs.

The sampling frame includes SMEs operating in fourteen African countries that have been carefully chosen to represent a wide range of economic diversity, regional characteristics, and the importance of sustainability issues in their respective industries. This sampling approach, influenced by the research of Masurel et al. [52], highlights the significance of considering various contexts when studying sustainable business practices. The selection of countries was made to improve the external validity of the study findings, allowing them to be applied and

generalised to different African contexts. The meticulous and wide-ranging sampling strategy ensures that the findings are representative and comprehensive.

The data were collected using the "Sustainability Practices in African Small and Medium-Scale Enterprises (SME) Supply Chains Questionnaire". This instrument was developed after conducting a thorough literature review and utilising validated scales, as suggested by experts in the field [51,53]. The design strongly emphasised the theoretical constructs proposed by Javalgi et al. [54] and the empirical research of Grieco et al. [55]. It aimed to delve into specific aspects of supply chain strategies and sustainability practices. This trustworthy data collection instrument guarantees the precision and reliability of our data. The weights for different variables in the questionnaire were determined based on their relevance and importance to the research questions. Factors such as the significance of sustainability practices, the impact on competitiveness, and the influence of stakeholder support were assigned equal weights to reflect their critical role in achieving the research objectives. Additionally, the empirical evidence from previous studies and theoretical constructs guided the weighting process to ensure a balanced and comprehensive analysis.

The questionnaire was administered using Qualtrics, an online survey platform which is well-regarded for its effectiveness and dependability in scholarly research [53]. This platform facilitated a methodical and reliable survey distribution, guaranteeing prompt and accurate data collection. The structured format of the questionnaire, along with the use of multiple-choice options, allowed for efficient data analysis and minimised the risk of biased responses. Qualtrics was selected for its specific features and capabilities, which played a crucial role in guaranteeing the integrity and dependability of the data gathered.

Research questions:

1. How does adopting sustainability practices influence SMEs' competitiveness in Africa?
2. How does integrating sustainability practices into operations affect supply chain management strategies of small and medium-sized enterprises (SMEs) in Africa?
3. How does the integration of sustainability practices within SME supply chains in Africa impact the level of stakeholder support?

Data Analysis Techniques

This study utilised descriptive and inferential statistical methods to investigate sustainability practices and their influence on performance metrics in supply chains of SMEs in different countries. Statistical Package for the Social Sciences (SPSS) and SEM were used to conduct the analyses, ensuring a comprehensive examination of the collected data. At first, SPSS was utilised to perform descriptive statistical analyses. This included

summarising the demographic characteristics of participants, such as gender, tenure with the employer, and company size. This phase provided essential baseline data on the sample composition, in line with the methodological recommendations of Field [56] and Hair et al. [57].

The inferential phase of the analysis utilised SEM to examine the connections between the underlying concepts of sustainability practices and performance metrics. The selection of SEM was based on its capacity to incorporate factor analysis and multiple regression, allowing for intricate model structures and accounting for measurement errors [58]. Two estimation methods were assessed within the SEM framework: covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM). Considering the nature of this research and the characteristics of the data, PLS-SEM was chosen for its ability to handle complex models effectively and its independence from the assumption of multivariate normality [59]. These analyses were made possible by the Smart-PLS software. The study established a significance level of 0.05 to detect significant differences within the data. This threshold is commonly used in statistical testing, ensuring that differences with p-values less than 0.05 are deemed statistically significant, thus upholding the rigour and validity of the findings [60].

Development of Measurement

The constructs of Competitiveness, SCM strategies, Sustainability Practices, and Stakeholder Support and Collaboration in this study were measured using a structured Likert scale questionnaire. This measurement instrument has been adapted from well-established scales used in previous research, which ensures its content validity and reliability. The measurement of each construct used multiple items rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). This approach is commonly employed in business research to capture attitudes and perceptions [61].

As the data were obtained from a single source, it is important to address the potential for Common Method Bias (CMB) to maintain the credibility of the study's results. CMB is a phenomenon where the measurement variance is mistakenly attributed to the measurement method rather than the actual constructs being measured. This can lead to overestimating the correlations observed between different constructs [62]. Various procedural strategies were employed during the questionnaire's design and administration to address the potential for bias. Firstly, the questions were ordered randomly to minimise potential response patterns that could falsify results [62]. Randomisation is a useful technique to reduce the impact of item-context effects and method variance. From a statistical perspective, the study utilised Harman's single-factor test, a technique commonly used in academic research to evaluate the potential influence of CMB when multiple constructs are being measured [63]. Using this method ensures all items are loaded onto a

single factor in an exploratory factor analysis to determine how much that factor can explain the variance. It is important to consider the possibility of significant common method variance if the analysis reveals a single factor or if one general factor explains much of the covariance among the measures. Based on the guidelines provided by Yamin [64], the analysis showed that the first unrotated factor accounted for only 7.893% of the variance, significantly lower than the threshold of 40%. This suggests that CMB is not a significant issue in this study.

Data Analysis Procedure

The data collected in this study underwent a thorough analytical process, utilising the (SPSS and SEM techniques to ensure a comprehensive analysis and interpretation. SPSS was used to calculate descriptive statistics, allowing for an initial analysis of the participant's demographic characteristics [56]. This entailed summarising categorical data such as gender, tenure with the employer, and company size, offering a crucial overview of the sample composition.

In the inferential analysis, the study employed SEM, a complex statistical technique that calculates relationships between latent constructs while considering measurement error [58]. SEM is a powerful tool for analysing theoretical models with intricate variable structures, as it combines factor and multiple regression analysis. Two estimation methods were evaluated within the SEM framework: the CB-SEM and the PLS-SEM. Considering the data characteristics and the goals of the research, PLS-SEM was chosen for its ability to handle intricate models effectively and its appropriateness for exploratory research, as it does not necessitate multivariate normality [57]. The Smart-PLS software was utilised for this purpose and was specifically developed to facilitate PLS-SEM analyses.

OVERVIEW OF RESULTS

The respondents' characteristics were obtained from 412 online surveys that showcased a wide range of demographic profiles. As indicated in Table 1, the gender distribution among respondents reflects a diverse and balanced sample, with nearly equal representation of male and female participants. Specifically, male respondents constitute 22.8% of the sample, while female respondents comprise 23.3%. This near parity suggests that the data collected provides a balanced perspective across genders, which is crucial for ensuring comprehensive and inclusive insights into the sustainability practices of SMEs in Africa. Additionally, a substantial proportion of respondents identify as non-binary, third gender, or transgender, with these groups accounting for 18.7% and 18.0% of the sample, respectively. Combined, these groups represent 36.7% of the respondents. This notable representation highlights the importance of recognising and including diverse gender identities in research. Such diversity enriches the study by offering deeper insights into the unique

challenges and perspectives these groups face within the SME sector in Africa. Interestingly, 17.2% of respondents preferred not to disclose their gender. This considerable proportion underscores the importance of privacy and confidentiality in research design. The preference for non-disclosure suggests that future studies should ensure participants feel comfortable and secure, encouraging greater authentic participation and responses. The gender distribution reveals that the study successfully captured various gender identities. This diversity is essential for a comprehensive analysis of sustainability practices in SMEs, as it ensures that the perspectives and experiences of various gender groups are considered. Such inclusivity is crucial for developing strategies that are effective and equitable across different segments of the population.

Table 1. Gender of respondents.

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	94	22.8	22.8	22.8
	Female	96	23.3	23.3	46.1
	Non-binary/third gender	77	18.7	18.7	64.8
	Transgender	74	18.0	18.0	82.8
	Prefer not to say	71	17.2	17.2	100.0
	Total	412	100.0	100.0	

The distribution of respondents' tenure at their current company reveals a diverse range of experiences among the participants (Table 2), offering valuable insights into sustainability practices and SCM within SMEs. The largest group of respondents, comprising 22.8% of the sample, have been with their current company for 1–5 years. This significant proportion of relatively new employees is crucial for understanding the initial stages of adopting and integrating sustainability practices within their organisations. Respondents with 6–10 years and 11–15 years of tenure each constitute 19.2% of the sample. These groups provide critical insights into the mid-term evolution of sustainability practices and their impact on supply chain strategies over time. Additionally, respondents with 16–20 years of tenure make up 17.7% of the sample. This group's experiences offer deep organisational knowledge and a long-term view of the implementation and effectiveness of sustainability practices and SCM strategies. Finally, 21.1% of respondents have been with their companies for over 20 years. These individuals provide a wealth of historical perspectives, offering insights into long-term sustainability practices, development, and maintenance. The tenure distribution among respondents indicates a balanced representation across various lengths of service. This diversity ensures a comprehensive understanding of how

SMEs adopt, integrate, and evolve sustainability practices and SCM strategies over time.

Table 2. Respondents working experience.

Number of years		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1–5	94	22.8	22.8	22.8
	6–10	79	19.2	19.2	42.0
	11–15	79	19.2	19.2	61.2
	16–20	73	17.7	17.7	78.9
	Over 20	87	21.1	21.1	100.0
	Total	412	100.0	100.0	

The distribution of respondents based on company size, in terms of the number of employees (Table 3), provides insightful data about the operational scale of SMEs participating in the study. The largest category of respondents comes from companies with 1–25 employees, 24.8% of the total sample. This significant proportion indicates that a quarter of the surveyed SMEs are very small enterprises, likely facing unique challenges and opportunities when implementing sustainability practices due to limited resources and smaller operational scale. Companies with 26–50 employees make up 18.2% of the respondents. This group provides a perspective on slightly larger SMEs, which might have more structured processes and resources than the smallest companies. Firms with 51–75 employees constitute 14.8% of the sample. This middle-tier size category is critical for understanding how medium-sized enterprises approach sustainability, balancing having enough resources to implement changes and facing some constraints typical of smaller businesses. The next category, companies with 76–100 employees, represents 19.4% of the respondents. These firms are larger SMEs that likely have more formalised structures and possibly more resources to invest in sustainability practices. Finally, 22.8% of respondents are from companies with over 100 employees. While still classified as SMEs, this group operates on a larger scale and may have more capabilities and infrastructures to support comprehensive sustainability initiatives.

Table 3. Company size and number of employees.

Number of employees		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1–25	102	24.8	24.8	24.8
	26–50	75	18.2	18.2	43.0
	51–76	61	14.8	14.8	57.8
	76–100	80	19.4	19.4	77.2
	Over 100	94	22.8	22.8	100.0
	Total	412	100.0	100.0	

The distribution of respondents based on their company's main industry or sector offers a comprehensive view of the diverse economic activities represented in the study. The largest group of respondents, as indicated by Table 4, comes from the retail sector, accounting for 20.6% of the total sample. This significant representation highlights the importance of retail SMEs in the economic landscape and their potential role in adopting and promoting sustainability practices. Following closely, the manufacturing sector represents 20.4% of the respondents. Manufacturing SMEs are crucial for understanding the implementation of sustainability practices, as this sector often deals with resource-intensive processes and has substantial environmental impacts. Insights from this group are vital for developing strategies to reduce waste and enhance efficiency. Agriculture, another key sector, constitutes 20.1% of the respondents. This sector's representation is particularly important given the critical role of agriculture in many African economies and its direct connection to environmental sustainability. Sustainable agriculture practices can have significant implications for food security, resource management, and environmental conservation. The service sector includes a broad range of businesses such as finance, healthcare, and education, making up 19.4% of the sample. This sector's diverse nature provides valuable insights into how different service-oriented SMEs approach sustainability. Given this sector's wide array of activities, the data can illuminate the varied sustainability challenges and practices. Lastly, 19.4% of respondents fall into the 'Other' category, representing industries not explicitly listed but still relevant to the study. This group ensures the analysis encompasses various economic activities, providing a holistic understanding of sustainability practices across different sectors.

Table 4. Respondents industry/sector.

Industry		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agriculture	83	20.1	20.1	20.1
	Manufacturing	84	20.4	20.4	40.5
	Service	80	19.4	19.4	60.0
	Retail	85	20.6	20.6	80.6
	Other	80	19.4	19.4	100.0
	Total	412	100.0	100.0	

The distribution of respondents based on the country in which their company is located offers a comprehensive view of the geographical diversity represented in the study (see Table 5). The largest group of respondents is from Nigeria, accounting for 12.3% of the total sample. This significant representation reflects Nigeria's substantial SME sector and its crucial role in the economic landscape of Africa, providing valuable insights into sustainability practices in one of the continent's largest economies. Following Nigeria, Cameroon and Chad each have

considerable representation, with 8.7% and 8.3% of respondents respectively. These countries contribute to understanding the sustainability practices within Central African SMEs, highlighting regional characteristics and challenges. Ghana represents 8.0% of the sample, providing perspectives from West Africa, while South Africa, with 7.8% of respondents, offers insights from the southern part of the continent. Both countries are key players in their respective regions and offer diverse economic contexts for analysing sustainability practices. Egypt, Niger, and Uganda each account for 7.5% of respondents. These countries, located in North and East Africa, add to the geographical disposition of the study, ensuring that various regional dynamics are considered in the analysis. Including Tunisia (6.6%) and Morocco (5.6%) further enriches the representation of North Africa, providing a broader understanding of the sustainability challenges and practices in this region. Benin, with 6.1% of respondents, along with smaller representations from Ethiopia (4.9%), Togo (4.9%), and Zimbabwe (4.4%), ensures that a diverse range of economic and regulatory environments are included in the study. Each of these countries adds unique perspectives, contributing to a comprehensive analysis of sustainability practices across the continent. The balanced representation across these fourteen countries—Benin, Cameroon, Chad, Egypt, Ethiopia, Ghana, Morocco, Niger, Nigeria, South Africa, Togo, Tunisia, Uganda, and Zimbabwe—ensures that the study captures a wide array of geographical contexts. This diversity is crucial for understanding the specific challenges and opportunities SMEs face in different African regions.

Table 5. Respondents Country/Location.

Country/Location		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Benin	25	6.1	6.1	6.1
	Cameroon	36	8.7	8.7	14.8
	Chad	34	8.3	8.3	23.1
	Egypt	31	7.5	7.5	30.6
	Ethiopia	20	4.9	4.9	35.4
	Ghana	33	8.0	8.0	43.4
	Morocco	23	5.6	5.6	49.0
	Niger	31	7.5	7.5	56.6
	Nigeria	51	12.3	12.3	68.9
	South Africa	32	7.8	7.8	76.7
	Togo	20	4.9	4.9	81.6
	Tunisia	27	6.6	6.6	88.1
	Uganda	31	7.5	7.5	95.6
	Zimbabwe	18	4.4	4.4	100.0
	Total	412	100.0	100.0	

Validation of the Measurement Model

The measurement model assessment was centred around establishing the reliability and validity of the constructs utilised in the study. The reliability of the construct was confirmed by calculating Cronbach's alpha (α) and composite reliability (CR) values. Both metrics surpassed the recommended threshold of 0.70, indicating strong internal consistency and reliability [65]. The assessment of convergent validity involved examining the Average Variance Extracted (AVE). All constructs were found to have exceeded the minimum criterion of 0.50, indicating a satisfactory level of convergent validity [66]. The results were presented systematically in Table 6. The table includes each construct's factor loadings, CR, AVE, and Cronbach's alpha values.

Table 6. Measurement Model.

Variables	Code	Loadings	Composite Reliability (CR)	Cronbach Alpha (CA)	Average Variance Extracted (AVE)
Competitiveness	COMP1	0.828	0.860	0.756	0.673
	COMP2	0.844			
	COMP3	0.788			
Stakeholder Support & Collaboration	STKH_SUP1	0.853	0.880	0.796	0.709
	STKH_SUP2	0.812			
	STKH_SUP3	0.861			
Supply Chain Management Strategies	SUP_CH1	0.733	0.904	0.878	0.574
	SUP_CH2	0.773			
	SUP_CH3	0.769			
	SUP_CH4	0.765			
	SUP_CH5	0.739			
	SUP_CH6	0.758			
	SUP_CH7	0.764			
Sustainability Practices	SUS_PRA1	0.842	0.917	0.879	0.733
	SUS_PRA2	0.879			
	SUS_PRA3	0.864			
	SUS_PRA4	0.840			

Validation of Measurement Model

It is crucial to validate the measurement model utilised to quantify constructs associated with competitiveness, SCM strategies, sustainability

practices, and stakeholder support and collaboration regarding maintaining the highest research standards. This step is of utmost importance in determining the accuracy and suitability of the constructs, especially pertaining to their reliability and validity. The measurement model analysis results showed that the constructs have a reliable and satisfactory level of construct reliability (Figure 1). The reliability of the measures was evaluated using various statistical methods, such as Cronbach's alpha and CR. These statistics surpassed the widely accepted threshold of 0.70, indicating a high level of internal consistency in the measurements [67]. This confirms that the measurement model effectively captures the intended constructs.

An assessment of convergent validity involved examining the AVE for each construct. The AVE is a measure that assesses the shared variance among observed variables attributed to the underlying construct. A value of 0.50 or higher is typically considered indicative of satisfactory convergent validity, as stated by Hair et al. [68]. The constructs play a crucial role in explaining a substantial portion of the variability in the observed variables. In addition, the constructs' discriminant validity was evaluated using the Fornell-Larcker criterion. This criterion is a reliable method for determining the degree to which a construct is genuinely separate from other constructs, both in terms of its conceptual and empirical aspects [66]. Based on this standard, it is expected that the square root of the AVE for each construct should be higher than the correlations between the construct and any other constructs in the model. This test validates the close relationship between the constructs and their measures, highlighting the individuality and uniqueness of each construct. Table 7 presents the analytical findings for discriminant validity. This involves the square roots of the AVEs on the diagonal and the correlations between the constructs below it. The measures provided clear evidence of their ability to differentiate between various constructs, thereby confirming the discriminant validity of the model.

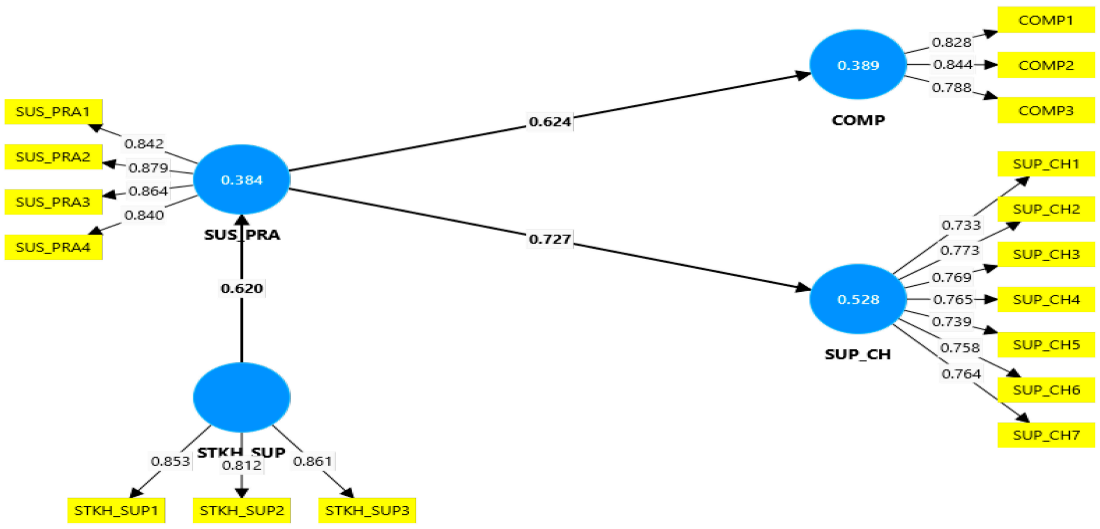

Figure 1. Measurement model.

Table 7. Fornell and Larcker Result.

Variables	COMP	STKH_SUP	SUP_CH	SUS_PRA
COMP	0.820	-	-	-
STKH_SUP	0.628	0.842	-	-
SUP_CH	0.689	0.662	0.758	-
SUS_PRA	0.624	0.620	0.727	0.856

Ensuring discriminant validity is paramount to guarantee that the constructs measured within a study are empirically distinct and not reflections of one another. This study utilises a meticulous approach to assess discriminant validity through cross-loading analysis, following recent methodological advancements [69], and foundational recommendations [66]. An essential aspect of cross-loading analysis is evaluating how each indicator's loading on its construct compares to its loading on other constructs. This method evaluates the extent to which each item or indicator of a construct is more closely associated with the construct it intends to measure than other constructs [59]. Consistant with Fornell and Larcker [66], a strong indication of discriminant validity is when the indicators load higher on their respective constructs than all other constructs in the model. In the context of this study, a thorough cross-loading analysis was carried out to ensure the clear differentiation of the constructs of competitiveness, SCM strategies, sustainability practices, and stakeholder support and collaboration. This was accomplished by comparing the loading of each indicator with the loadings across other relevant constructs within the structural model.

The cross-loading analysis findings revealed that the indicators exhibited a stronger association with their respective constructs compared to any other constructs within the model. This suggests strong discriminant validity, confirming that the constructs are separate and measure different aspects of the studied phenomena. These findings are of utmost importance, as they validate that the constructs intersect and encompass distinct aspects of the research questions presented. Table 8 comprehensively summarises the indicator loadings and their comparisons across different constructs. This table presents a concise visual representation of the cross-loadings, making it easier to comprehend how each indicator primarily relates to its corresponding construct. The transparency in reporting adds to the credibility and scholarly rigour of the study's methodology.

Table 8. Cross-loadings analysis.

Constructs	COMP	STKH_SUP	SUP_CH	SUS_PRA
COMP1	0.828	0.445	0.595	0.505
COMP2	0.844	0.440	0.551	0.495
COMP3	0.788	0.649	0.547	0.531
STKH_SUP1	0.586	0.853	0.531	0.569
STKH_SUP2	0.458	0.812	0.585	0.433
STKH_SUP3	0.529	0.861	0.568	0.547
SUP_CH1	0.568	0.497	0.733	0.716
SUP_CH2	0.479	0.474	0.773	0.570
SUP_CH3	0.491	0.514	0.769	0.550
SUP_CH4	0.469	0.467	0.765	0.460
SUP_CH5	0.571	0.551	0.739	0.487
SUP_CH6	0.493	0.529	0.758	0.476
SUP_CH7	0.561	0.479	0.764	0.503
SUS_PRA1	0.544	0.505	0.598	0.842
SUS_PRA2	0.527	0.521	0.632	0.879
SUS_PRA3	0.514	0.574	0.631	0.864
SUS_PRA4	0.551	0.522	0.627	0.840

The Heterotrait-Monotrait (HTMT) ratio of correlations is a modern standard used to evaluate discriminant validity in behavioural research. First introduced by Gold et al. [70] and later enhanced by Kline [71], the HTMT ratio is a reliable statistical method used to assess the uniqueness of latent constructs in a measurement model. This study utilised the HTMT ratio to evaluate the discriminant validity of constructs measured through the PLS-SEM technique. The HTMT ratio is calculated by taking the average of the correlations between different traits and methods then comparing it to the average of the correlations between the same traits but different methods. A lower HTMT ratio signifies a stronger level of discriminant validity between constructs.

In line with the guidelines by Gold et al. [70], a HTMT value below or equal to 0.90 is generally considered to demonstrate satisfactory discriminant validity. Nevertheless, a more rigorous evaluation indicates that an HTMT value below 0.85 offers more conclusive proof of discriminant validity [72]. The current study adopted a more conservative threshold to ensure a higher validation standard and enhance the reliability of the findings. The PLS analysis showed that all HTMT ratios were below the conservative threshold of 0.85. This result affirms that the examined concepts differ, strengthening the measurement model's validity. The results of this study support the model's ability to distinguish between different concepts without any significant overlap accurately. Table 9 records the precise findings obtained through the HTMT ratio analysis. This table presents the HTMT ratios for each pair of constructs, enabling a thorough examination of the discriminant validity throughout the model. Displaying these findings in a tabular format promotes

transparency and facilitates easy verification of the criteria for discriminant validity.

Table 9. Heterotrait-Monotrait criterion.

Variables	COMP	STKH_SUP	SUP_CH	SUS_PRA
COMP	-	-	-	-
STKH_SUP	0.796	-	-	-
SUP_CH	0.838	0.795	-	-
SUS_PRA	0.764	0.732	0.806	-

Structural Model Assessment

Evaluating the structural model in quantitative research requires thoroughly examining various statistical metrics to test the theoretical relationships between constructs. The metrics mentioned in this study are essential for validating the proposed model. They include path coefficients, *t*-statistics, significance levels, and the coefficient of determination (R^2) [59]. To strengthen the reliability of the findings, the study utilises a bootstrap resampling technique. This technique is highly regarded in the field of SEM for its ability to generate standard errors and assess the reliability of the estimates [73]. To fulfil this objective, a simulated dataset containing 3000 observations was generated. The decision to use 3000 bootstrap samples is in line with the suggestions made by Preacher and Hayes [74]. They argue that larger bootstrap samples can lead to more precise and dependable confidence intervals for the estimates.

The results obtained from the structural model assessment are thoroughly outlined in Table 10. This table presents the estimated path coefficients, which reveal the strength and direction of the relationships between constructs. It also includes the *t*-statistics, which serve as a basis for testing the statistical significance of these relationships. Additionally, the associated *p*-values are provided to assess the significance of the findings against a conventional threshold (usually $p < 0.05$). Furthermore, the model provides the coefficient of determination (R^2) for each endogenous construct, which gives valuable information about the amount of variance that can be explained by the independent variables. This measure is essential for evaluating the model's ability to explain the overall effectiveness of the constructs in capturing the dynamics of the relationships studied.

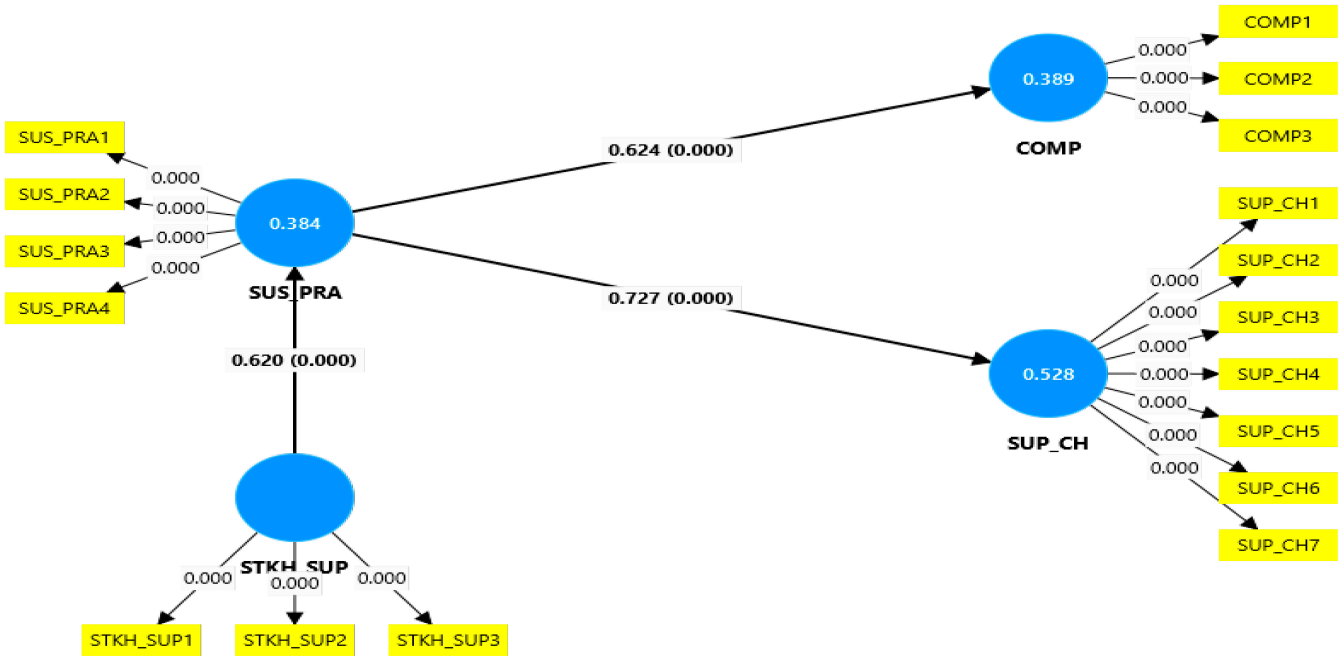

Figure 2. Structural model.

Table 10. Hypotheses testing.

Variables	Coefficient	Standard deviation (STDEV)	*t* statistics (|O/STDEV|)	*p* values	Decision
SUS_PRA -> COMP	0.624	0.035	17.883	0.000	Significant
SUS_PRA -> SUP_CH	0.727	0.031	23.732	0.000	Significant
STKH_SUP -> SUS_PRA	0.620	0.041	14.938	0.000	Significant

Hypothesis Testing

The structural model's evaluation primarily involves assessing the relationships proposed in the study. This is done by estimating path coefficients (Figure 2), *t*-statistics, and significance levels. This approach emphasises the importance of making inferences from the data that are statistically valid and accurately represent the underlying dynamics of the constructs.

Hypothesis H1(a): Examining the Impact of Sustainability Practices on SME Competitiveness.

One hypothesis suggests that adopting sustainability practices can positively impact the competitiveness of SMEs in Africa. The structural model analysis supports this hypothesis, as indicated by a path coefficient (β) of 0.624. The finding presented here carries substantial weight in the academic realm, supported by a robust *t*-statistic of 17.883 and a *p*-value of less than 0.0001. These figures unequivocally demonstrate the powerful and positive impact of sustainability practices on the SME competitiveness.

Hypothesis H2(a): Examining the Influence of Sustainability Practices on Supply Chain Management Strategies.

The second hypothesis examines the impact of incorporating sustainability practices into operations on SCM strategies adopted by African SMEs'. The findings reveal a significant path coefficient (β) of 0.727, demonstrating a strong relationship. This result is supported by a high *t*-statistic of 23.732 and a *p*-value of less than 0.0001. This highlights the importance of sustainability practices influencing supply chain management strategies among African SMEs.

Hypothesis H3(a): Examining the Role of Stakeholder Support in Sustainability Integration.

The third hypothesis explores the effects of stakeholder support on integrating sustainability practices within SME supply chains in Africa. The estimated path coefficient (β) is 0.620, with a *t*-statistic of 14.938 and a *p*-value of less than 0.0001. This study's results highlight the importance of stakeholder support in promoting sustainable practices within SMEs and emphasises the significance into the stakeholders' significant role in fostering sustainability in supply chains.

Table 11. The coefficient of determination (R2), effect size (f2), and blindfolding (Q2) are all important measures in research and analysis. These metrics are critical in evaluating relationships' strength and significance and assessing models' predictive power. Understanding and utilising these concepts is essential for rigorous and scholarly academic work.

Table 11. Coefficient of determination (R^2), effect size (f^2), and blind folding (Q^2).

Factor	r^2	f^2	Q^2	Remark
Competitiveness	0.389	0.637	0.331	Substantial
Supply Chain Management Strategies	0.528	1.119	0.390	-
Sustainability Practices	0.384	-	0.373	Substantial
Stakeholder Support and Collaboration	-	0.624	-	-

The evaluation of the structural model effectiveness requires the examination of various factors, such as the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2). These statistical measures offer valuable insights into the model's ability to explain, the strength of the independent variables' impact on the dependent variables, and the model's accuracy in making predictions. The coefficient of determination, R^2, measures the extent to which the independent variables in the model can account for the variation in the dependent variables. Based on the findings of this study, it is evident that a significant portion of competitiveness, SCM strategies, and sustainability practices can be accounted for. Specifically, 38.9% of competitiveness, 52.8% of SCM strategies, and 38.4% of sustainability practices can be explained. The

values indicate a significant level of explanatory power across the constructs, showing that the model effectively captures the dynamics of SME operations.

The effect size, f^2, evaluates the strength of the relationship between independent and dependent variables in a scholarly manner. According to Cohen [75], a f^2 value of 0.02 is considered small, 0.15 is considered medium, and 0.35 is considered large. The effect sizes obtained for this model demonstrate significant impacts on sustainability practices, competitiveness, and SCM. These findings highlight the critical importance of stakeholder support in driving these outcomes. The results of this study highlight the significant impact of stakeholder support and sustainability practices on the dependent variables, emphasising their importance in improving SME operations.

The blindfolding technique, a cross-validation method employed in this study, was used to assess the predictive relevance, Q^2. This technique involves omitting part of the data during parameter estimation to evaluate the model's ability to make accurate predictions [76]. The Q^2 values achieved were 33.1% for sustainability practices, 39.0% for competitiveness, and 37.3% for SCM. Values greater than 0 indicate that the model is highly relevant and can make significant predictions about the dependent variables based on the observed data.

DISCUSSION OF FINDINGS

Within sustainability practices, this study highlights African SMEs' challenges, such as limited resources, inadequate infrastructure, and a lack of stakeholder support. This aligns with the research conducted by Alberts & Naude [10] and Awuah, Amoako & Ahmed [11], who highlight the difficulties associated with incorporating sustainable practices. These challenges are often attributed to external factors such as insufficient governmental frameworks and unpredictable political environments. However, in contrast to previous studies focusing on immediate outcomes, this paper takes a more comprehensive approach by considering the practices of long-term sustainability and effectiveness. This aspect is often neglected in current research. This offers a more profound comprehension of the long-term effects of sustainability, making a substantial contribution to the academic discourse. It establishes a connection between continual sustainability initiatives and strategic business results, such as enhanced competitiveness and efficiency in the supply chain. In contrast to the study by Kosasih et al. [14], which primarily emphasises immediate operational efficiencies, the findings of this research indicate that the integration of sustainable practices offers wider strategic benefits. These include enhancing brand reputation and aligning with the growing global market demands for sustainability. A broader perspective is essential for grasping the competitive advantage that sustainability can provide to SMEs in a globalised market. The study findings align with the research conducted by Ahmadov et al. [37],

highlighting the connection between sustainability practices and competitiveness. According to Ahmadov et al. [37], sustainable practices can enhance resource efficiency, boost brand reputation, and align with Porter's Theory of Competitive Advantage, thus providing organisations with a competitive edge. These findings indicate that sustainability provides significant strategic advantages beyond environmental and social benefits, establishing it as a crucial factor in enhancing SME competitiveness and operational effectiveness. This study highlights theoretical and practical importance of sustainability in business operations by drawing on established scholarly works and presenting fresh perspectives on the African SME landscape. It also creates avenues for additional empirical research and the formulation of specific policies and strategies to foster the adoption of sustainable practices in African SMEs diverse and demanding environments.

In SCM, the study's examination of strategies in African SMEs brings significant intricacy to ongoing conversations. Prior studies conducted by Rosa & Rizzi [5] and Gunasekaran et al. [6] have predominantly centred on reducing operational costs and managing waste. This study takes a comprehensive approach, exploring how sustainability practices in SCM can lead to cost reduction, resilience, and innovation, all of which are crucial for long-term sustainability. This aligns with the theoretical frameworks of Porter [25] and the Resource-Based View [41,42], emphasising the strategic utilisation of local resources and capabilities to create competitive advantages. In addition, the study's findings highlight the strong impact of sustainability practices on SCM strategies, aligning with previous research conducted by Kosasih et al. [15]. This research emphasises the importance of incorporating waste reduction and resource optimisation into SME supply chains. Thus, SMEs can enhance their operational resilience and improve their market positioning beyond simply reducing costs. Furthermore, this research provides a valuable perspective on the direct impact of sustainability on supply chain operations. The study offers actionable insights for SMEs and policymakers by quantifying this relationship. These insights are crucial for developing tailored strategies that enhance the adoption and effectiveness of sustainable practices in SMEs, especially in developing economies like Africa. Ultimately, this research contributes to a more holistic understanding of sustainability as a vital business strategy component, addressing global standards and local needs. In addition, the study's emphasis on SCM effectiveness highlights the significance of taking a comprehensive approach to sustainability that considers the entire value chain. By incorporating sustainability principles into supply chain operations, SMEs can strengthen their ability to withstand external disruptions, optimise resource usage, and generate value for all parties involved. This aligns with the increasing acknowledgement of supply chains as vital tools for promoting sustainable development and

innovation in SMEs. It also emphasises the importance of collaborative approaches that involve suppliers, customers, and other stakeholders.

In addition, highlighting the importance of stakeholder support as a crucial factor in implementing sustainability practices provides a valuable expansion to Freeman's [38] Stakeholder Theory. The study emphasises various stakeholder interactions that are crucial in supporting or hindering the adoption of sustainability practices in SMEs. This nuanced analysis provides valuable insights for policymakers and business leaders to develop more impactful strategies for engaging stakeholders. The study highlights the importance of stakeholder support in promoting and incorporating sustainability practices in SME supply chains. This aligns with Freeman's stakeholder theory [38], which emphasises the significance of considering the interests of all stakeholders. Stakeholder engagement is crucial when successfully implementing sustainable practices, highlighting stakeholders' significant impact on shaping business strategy formulation and execution. In addition, the study emphasises the importance of taking a comprehensive approach to sustainability, considering the interdependence of economic, social, and environmental factors. This research highlights the importance of a comprehensive understanding of sustainability by focusing on stakeholder engagement and examining African SMEs' specific challenges. It goes beyond mere compliance or cost-saving measures and emphasises the need for sustainable development and resilience of SMEs. This is particularly crucial in regions where socio-economic factors present unique obstacles to sustainability initiatives.

Furthermore, the study contributes to the broader discussion on sustainable business practices by highlighting the specific obstacles that African SMEs encounter when trying to incorporate sustainability measures. This illuminates Africa's economic, cultural, and regulatory landscapes, offering context-specific insights essential for comprehending and tackling the intricacies of sustainable business operations in the region. Aside from its theoretical implications, the study provides practical insights that can be valuable for SMEs and policymakers interested in promoting sustainable business practices. This study provides valuable insights into how sustainability can improve competitiveness and operational effectiveness in SMEs, specifically focusing on the African context. This research contributes to the existing body of knowledge in sustainable business practices by building upon previous studies, offering fresh perspectives, and presenting actionable recommendations.

CONCLUSION

This study contributes to knowledge of sustainable practices and SCM strategies in Africa's SMEs. By examining the integration of sustainability practices and their impact on competitiveness and supply chain effectiveness, this study highlights the importance of sustainability initiatives for SMEs. The findings emphasise the multifaceted nature of

these initiatives and their influence on SME performance and stakeholder interactions, which are vital for long-term viability and market competitiveness. This study expands upon the existing body of research by emphasising the strategic advantages of sustainability that go beyond mere cost reductions and operational streamlining. It presents empirical evidence demonstrating the connection between long-term sustainability practices and improved competitive positioning, which is especially relevant in African SMEs. These findings have important implications for SMEs, policymakers, and other stakeholders interested in promoting sustainable development and resilience in African economies and beyond.

This research contributes to the ongoing discussion in strategic management and sustainability literature by providing empirical evidence for the validity of the Resource-Based View (RBV) and Porter's Theory of Competitive Advantage in the specific context of African SMEs. This highlights the importance of utilising internal capabilities, particularly sustainable practices, to gain a competitive edge in environments with limited resources. In addition, the research expands the scope of Stakeholder Theory by emphasising the influence of various forms of stakeholder support, beyond financial contributions, on the effective incorporation of sustainability into the operational and strategic frameworks of SMEs. This comprehensive understanding enhances the theoretical frameworks regarding how businesses develop economies while effectively navigating and leveraging sustainability to gain a competitive edge.

For practitioners, especially those working in African SMEs, this study provides practical insights into incorporating sustainability into key business operations, resulting in improved competitive advantages and operational efficiencies. The findings indicate that SMEs can reap substantial advantages by implementing strategic sustainability practices. These practices can enhance brand reputation and align with global sustainability standards. As a result, SMEs can attract more lucrative market opportunities and foster greater customer loyalty. The study emphasises the importance of SME managers taking a comprehensive perspective on sustainability, viewing it not just as a requirement or a way to save costs, but as a crucial business priority contributing to long-term success. The available evidence strongly indicates the necessity of implementing specific policy interventions that can effectively address the obstacles hindering the adoption of sustainable practices in African SMEs. Policymakers are encouraged to explore frameworks that promote greater accessibility to green technologies, provide financial incentives for adopting sustainable practices, and offer robust regulatory support for sustainability standards. Improving infrastructure and creating a favourable regulatory environment would help address the operational difficulties these SMEs face, enabling them to adopt more sustainable practices faster.

This study contributes valuable insights to the existing body of literature by offering a comprehensive analysis of the effects of sustainability in SCM, specifically focusing on African SMEs. This area has been largely overlooked in previous research. This dataset provides a valuable resource for scholars to analyse and expand upon, significantly contributing to the ongoing global discussion on sustainable development in emerging markets. Furthermore, incorporating various theoretical frameworks offers a more in-depth and all-encompassing foundation for future scholarly investigations into the strategic management of sustainability.

It would be beneficial for future research to conduct longitudinal studies that track the evolution and long-term impacts of sustainable practices within SMEs across various African regions. These studies could delve into the causal relationships between implementing sustainability measures and measuring business performance over long periods of time. In addition, conducting comparative studies on SMEs at various development or operational scales could provide valuable insights into customising or enhancing sustainability strategies based on company size or maturity. Ultimately, exploring the impact of technological innovation on sustainability practices could offer valuable insights for professionals and policymakers.

DATA AVAILABILITY

The dataset generated from (or analyzed in) the study can be found at https://data.mendeley.com/datasets/4km522jmw7/1.

CONFLICTS OF INTEREST

The author declares that there is no conflict of interest.

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