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Does environmental uncertainty influence the application of strategic management accounting? An investigation of listed manufacturing firms in Nigeria

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Abstract

Aim/purpose – This research investigates the influence of environmental uncertainty on applying strategic management accounting among listed manufacturing companies in Nigeria.

Design/methodology/approach – The study population comprises 76 manufacturing firms listed on the Nigerian Stock Exchange as of December 2023, with a sample size of 60 firms derived using the Green (1991) formula. The data collection method involved administering a structured questionnaire. The independent variables include competition intensity, market turbulence, and environmental uncertainty, while the dependent variable is the application of strategic management accounting. The factor loading test confirmed the construct's validity and reliability, as indicated by Cronbach's alpha test and Bartlett's test of sphericity, which demonstrated internal consistency. Additionally, the Kaiser–Meyer–Olkin test was used to verify the sampling adequacy. Pearson Correlation and variance inflation factor tests confirmed the absence of multi-collinearity, and multiple regression analysis was employed to estimate the model.

Findings – The article reveals that competition intensity, market turbulence, and environmental uncertainty significantly influence strategic management accounting applications.

Research implications and limitations – These findings have theoretical, managerial, and practical implications for manufacturing firms. They stress the importance of strategic management accounting in times of environmental uncertainty. The study recom-

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mends that firms adopt strategic management accounting in response to increased competitive intensity, market turbulence, and environmental uncertainty. The study's limitations are sample size, industry, scope, and variables.

Originality/value/contributions – It contributes to the existing literature, offers valuable insights to academia, industry experts, and practitioners, and sheds light on and bridges the knowledge gap between environmental uncertainty and the application of strategic management accounting.

Keywords: Competitive intensity, market turbulence, environmental uncertainty, and strategic management accounting.

JEL Classification: M40, M41, M31 L60.

1. Introduction

In today's ever-changing and complex business landscape, organizations face a multitude of uncertainties stemming from their external environment, which in turn influences their structural, operational, and decision-making processes (Merchant & Van der Stede, 2007). To navigate these uncertainties, the application of strategic management accounting (SMA) has been proposed as a means to enhance firms' capabilities in strategic decision-making and operational efficiency (Otley, 2016). As a result, this has brought environmental uncertainty to the forefront of strategic management accounting research, an essential factor influencing organizations' approaches to managing their strategic operations (Đđ, 2022).

Environmental uncertainty is how managers perceive the business environment as unpredictable, ambiguous, and uncertain (Dess et al., 2005). As an emerging field, studies have emphasized the importance of environmental uncertainty in shaping organizations' strategic decision-making and resource allocation processes (Merchant & Van der Stede, 2007). In uncertain environments, predicting future demand, identifying cost drivers, and making accurate financial forecasts are complex, requiring firms to consider the application of sophisticated management accounting practices because of the enhancement of decision-making and performance evaluation (Do & Tran, 2024; Merchant & Van der Stede, 2007).

SMA can give manufacturing firms better insights into their cost structures and help them respond effectively to environmental uncertainties (Otley, 2016). More importantly, the scarcity of information and the inherent unpredictability in the business environment require firms to formulate flexible strategies for swift responses (Do & Tran, 2024). In this respect, SMA practices are veritable tools for strategy formulation, providing managers with varied risk-oriented solutions to address numerous adverse effects of environmental uncertainty (Do & Tran, 2024). The practices are a combination of strategies and management accounting tools (Kenisah

& Carolina, 2024) and are essential, especially given the changes occurring in the business environment (Cescon et al., 2019; Petera & Šoljaková, 2020). In support, numerous studies have highlighted the immense advantages of SMA, propagating and promoting its acceptance as the new norm in adapting to constantly changing business environmental conditions (Londiwe & Zwelihle, 2024).

In the Nigerian context, the business environment is constantly changing and rife with various uncertainties, including economic instability, political factors, infrastructural challenges, and regulatory complexities (Ogege & Uwuigbe, 2018; Olalere & Fatoki, 2021). Apart, it is characterized by limited financial resources, low production capacity, volatile and high exchange rates, inadequate infrastructure, diminished public perception of locally manufactured products, and a lack of strategic initiatives (Orjiude, 2021), which has resulted in many businesses closing shop for inability to adapt (Olalere & Fatoki, 2021). As such, it is tempting to ask whether manufacturing firms in Nigeria apply strategic management accounting to navigate environmental uncertainties. This has remained unclear from the available literature. This lack of clarity may have contributed to the limited understanding and research in Nigeria, despite numerous studies exploring the influence of environmental uncertainty on the application of SMA practices within specific contexts. It is evident that many studies in the extant literature have focused on how different aspects of environmental uncertainty influence the application of SMA. Studies by Bui et al. (2020), Ngoc Phi Anh (2012), and Vu Thi Quynh (2021) examined competitive intensity and SMA usage. Đố (2022), Huyen (2022), and Nguyen et al. (2023) examined market turbulence and the adoption of SMA. Đố (2022), Huyen (2022), and Pavlatos (2015) investigated environmental uncertainty and the adoption of SMA. However, these studies were conducted in advanced countries. These genres of studies are relatively scarce in Nigeria (Ojua, 2021), particularly those that examine the influence of competition intensity, market turbulence, and environmental uncertainty on SMA application, which is the focal research interest in this study and highlights the need for an empirical investigation.

Recognizing this gap, this study aims to investigate how environmental uncertainty affects the application of SMA by manufacturing firms in Nigeria. Thus, the research question is whether competition intensity, market turbulence, and environmental uncertainty determine the application of strategic management accounting. The primary motivations behind this research are the lack of empirical studies on how environmental uncertainty influences the application of SMA in Nigeria, and secondly, the need to understand how firms can adapt their strategic management accounting practices to navigate unpredictable and volatile business environments.

The research is characterized by its quantitative approach, involving a survey of 74 manufacturing firms in Nigeria. Data were successfully collected from 60 of these firms, yielding 190 valid responses, which corresponds to a response rate of 90.47%. The data were collected using structured questionnaires, and the potential biases related to the instrument were addressed in the study using distinct Likert scales and expert-viewed items. Following an assessment of data adequacy and suitability through various preliminary tests, multiple regression analysis was employed to examine the influence of competition intensity, turbulence, and environmental uncertainty on the application of SMA. By conducting this research, the study aims to contribute to the existing literature on SMA and provide insights into the practical application of SMA in managing environmental uncertainties. Moreover, it provides valuable insights to academia, industry experts, and practitioners, shedding light on the contextual environmental factors that influence the application of strategic management accounting practices and help organizations develop strategies to navigate environmental uncertainties. Furthermore, it aids in closing the knowledge gap that can enhance the theoretical comprehension of SMA and environmental uncertainty, along with the managerial and practical insights and implications.

The subsequent sections of this paper are structured as follows: Section 2 outlines the literature review in terms of the theoretical underpinnings, empirical literature, and the development of hypotheses. Section 3 expounded upon the methodology. The findings of the data analysis are detailed in Section 4. Section 5 delves into a discussion of the research results, while Section 6 encompasses the conclusion, policy implications, and recommendations.

2. Literature review

The relevant theory underpinning the influence of environmental uncertainty on strategic management accounting applications is rooted in contingency theory. This theory posits that there is no universal approach to strategic management accounting practices, and the effectiveness of an approach depends on the specific characteristics of the situation or environment in which an organization operates (Chenhall, 2003). Organizations should tailor their management accounting practices to meet the unique demands and challenges of their external environment, thereby achieving optimal performance (Otley, 1980). Environmental uncertainty as a variable can manifest in various forms, including industry traits, competitive dynamics, technological advancements, regulatory requirements, and customer expectations, which can significantly shape the selection and im-

plementation of strategic management accounting. This underscores the importance of contingency theory in the current study, as it recognizes the ever-changing nature of the business environment and the necessity for a flexible and adaptive approach to strategic management accounting practices. Furthermore, it acknowledges that different environmental factors may necessitate distinct strategic responses and corresponding management accounting techniques (Chenhall, 2003). Additionally, the structures, processes, and systems within an organization are influenced by both environmental and firm-specific factors (Cadez & Guilding, 2008).

Nigeria's manufacturing sector operates in a highly unpredictable landscape of fierce competition, which may influence how manufacturing firms allocate resources and adjust their accounting practices to ensure their survival and growth. The competitive dynamics within the industry tend to compel manufacturing companies to adapt to maintain their market position, driven by various factors, including swift shifts in competitor behavior, evolving customer preferences, and prevailing market trends (Olalere & Fatoki, 2021). Leveraging this information, firms can refine their strategies, pricing models, and marketing approaches to either match or surpass their competitors, thereby underscoring the significance of strategic management accounting in maintaining a competitive advantage. This relationship illustrates the connection between contingency theory and competitive intensity, with competitive intensity as a contingent factor that drives the adoption of strategic management accounting practices.

Apart from this, the manufacturing industry in Nigeria is also facing considerable market volatility, characterized by fluctuating consumer demand, regulatory ambiguities, technological disruptions, and competitive challenges (Ogege & Uwuigbe, 2018). Manufacturing enterprises must comprehensively understand these changing conditions to manage these obstacles and formulate strategic responses. By continuously monitoring these elements, manufacturing companies in Nigeria can refine their strategies to tackle new challenges and capitalize on emerging opportunities, highlighting the critical role of SMA in unstable markets (Kariuki & Kamau, 2014). This illustrates the connection between contingency theory and market turbulence, where market turbulence is acknowledged as an external factor that can profoundly influence the type of SMA organizations utilize (Burns & Stalker, 1961).

Furthermore, the extent of fluctuations in exchange rates, unpredictable regulatory changes, and ongoing shifts in consumer demand highlight the considerable environmental uncertainty faced by Nigeria's manufacturing sector (Orjiude, 2021). To effectively navigate these challenges, manufacturing firms require valuable insights, which can be achieved through the implementation of

SMA, which can equip them with pertinent information to enhance strategies for managing and succeeding in an uncertain environment. Against this backdrop, the contingency theory acknowledges environmental uncertainty as a catalyst for adopting SMA. Under environmental uncertainty, firms are likely to be driven to collect strategic information to identify and effectively manage associated risks, as well as capitalize on potential opportunities to explore through SMA application. As such, this establishes a connection between contingency theory and environmental uncertainty. Given the above conditions in Nigeria, the contingency theory offers a valuable framework for examining how organizations respond to competition intensity, market turbulence, and environmental uncertainty in relation to SMA applications.

Studies have examined the influence of competition intensity on SMA application in different countries and contexts, yielding varying findings. Competition intensity refers to the level of competition among organizations for different resources (Gordon & Narayanan, 1984). Previous research studies have demonstrated that competitive intensity has a notable positive influence on the application of strategic management accounting (Kariuki & Kamau, 2016; Pavlatos, 2015). McManus (2013) conducted a study on firms in the Australian hospitality sector and found a positive relationship between competition intensity and the application of SMA. Similarly, Cescon et al. (2019) reported similar results in Italy, where competition intensity had a positive influence on the application of SMA practices such as strategic pricing, balanced scorecard, risk analysis, target costing, and life cycle costing in large Italian manufacturing firms. The positive influence of competition on SMA practices was also reported in the works of Chongruksut (2013), Ngoc Phi Anh (2012), and Thapayom (2019). Similar findings were reported in the works of Bui et al (2020) and Vu Thi Quynh (2021). Nevertheless, Ojra (2014) found a negative influence of competition intensity on SMA application among the studied firms in Palestine. However, recent studies have shown that competition intensity continues to have a significant positive influence on SMA application (Nguyen et al., 2023; Kenisah & Carolina, 2024; Rashid et al., 2024). Based on these findings, the study proposes the following:

H1: Competition intensity has a significant influence on the application of Strategic Management Accounting

Several other studies have examined the influence of market turbulence on the application of SMA. Market turbulence refers to the continuous fluctuations and uncertainties arising from various factors, including changes in customer preferences, pricing, cost structures, and the competitive landscape. These factors – technological advancements, evolving customer demands, intensified competition, and shifting regulations – contribute to the dynamic nature of the market (Calan-

tone et al., 2003; Miller & Friesen, 1983). The extent of market turbulence determines the need for firms to adapt their products and approach the market more frequently (Kandemir et al., 2006). To survive and thrive in turbulent markets, organizations often need to adopt agile and proactive strategies that can effectively respond to rapid and disruptive changes (Eisenhardt & Brown, 1998). Strategic management accounting, such as strategic market analysis, can play a crucial role in helping firms anticipate and evaluate different future scenarios based on market conditions and assumptions (Makadok, 2001). By better understanding market turbulence, firms can proactively adjust their strategies to capitalize on emerging opportunities and mitigate potential risks (Helfat & Peteraf, 2003). Empirical evidence, such as the study conducted by Ojra (2014) on Palestinian firms, suggests that market turbulence has a significant negative impact on the application of SMA. However, other studies have shown that market turbulence positively and significantly influences the extent to which firms utilize SMA tools (Okoye & Nnenna, 2019; Al-Mawali, 2015; Pavlatos, 2015). More recently, Đỗ (2022), Huyen (2022), and Nguyen et al. (2023) reported that market turbulence has positive and significant influence on SMA application. Based on these findings, this study proposes the following hypothesis:

H2: Market turbulence has a significant influence on the application of Strategic Management Accounting.

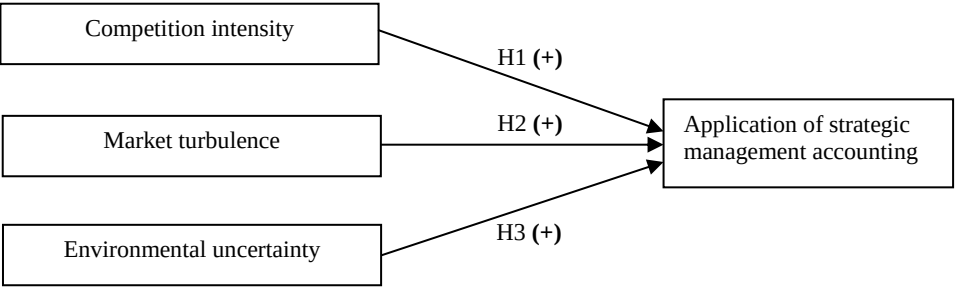
A firm's operational environment, shaped by various interacting factors, leads to environmental uncertainty that can influence SMA in a specific context. Scholars argue that environmental uncertainty is linked to applying different strategic management accounting practices, as it encourages proactive behavior and the use of externally focused accounting systems. Research by Chenhall and Morris (1986) suggested that firms operating in uncertain environments view strategic management accounting systems as valuable tools for providing timely and relevant information for decision-making and strategic planning. Various studies have shown that environmental uncertainty plays a significant role in determining the extent to which firms implement strategic management accounting practices (Abdel-Kader & Luther, 2008). For example, Al-Mawali and Chongruksut (2013), Pavlatos (2015), and Zainuddin and Nasir (2012) found a positive relationship between environmental uncertainty and the application of strategic management accounting. Similar results were revealed in the works of Cescon et al. (2019), Ojua (2021), and Sumkaew and Intanon (2020). Most recently, Do and Tran (2024), Ngoc Hung (2023), and Rashid et al. (2024) reported the positive influence of environmental uncertainty on the application of strategic management accounting. However, Erserim (2012) and Kenisah and

Carolina (2024) reported no association between environmental uncertainty and the adoption of SMA. Therefore, this study proposes the following hypothesis:

H3: Environmental uncertainty has a significant influence on the application of strategic management accounting.

In line with the hypotheses, the study’s research framework is illustrated in Figure 1.

Figure 1. Study’s research framework



Source: Author’s own elaboration.

The study’s conceptual framework for examining SMA among manufacturing firms in Nigeria is structured around three independent variables: competition intensity, market turbulence, and environmental uncertainty. Each variable is posited to affect the application of SMA as an external factor that influences managerial decision-making and strategic initiatives within an organization. Competition intensity drives firms to implement innovative strategies to sustain their market share and profitability (Porter, 1980). This pressure encourages firms to adopt advanced management accounting techniques to collect data on competitor behavior, facilitating proactive and informed decision-making (Guilding et al., 2000). Researchers assert that this leads to the use of SMA tools to gain insights into competitors’ pricing strategies, product offerings, and cost structures, thereby enhancing competitive advantage (Langfield-Smith, 2008). Market turbulence is defined by rapid changes in customer preferences, technological advancements, and varying market growth rates (Jaworski & Kohli, 1993). In such dynamic environments, firms are believed to benefit from the adaptability and responsiveness afforded by SMA, which allows for ongoing monitoring of market trends and swift strategic adjustments to meet the challenges posed by fluctuating market conditions (Simons, 1995). Environmental uncertainty encompasses unpredictable economic shifts, regulatory changes, and technological progress that affect the business landscape (Milliken, 1987), necessitating firms to process substantial amounts of information to mitigate risks and capitalize on emerging opportunities (Chenhall & Morris, 1986).

SMA enables organizations to evaluate complex external variables and implement strategic adjustments to manage uncertainty (Abernethy & Brownell, 1999). It encompasses a range of accounting tools that facilitate strategic decision-making by offering a comprehensive perspective on organizational performance. Implementing SMA is often motivated by external pressures such as competitive intensity, market volatility, and environmental unpredictability, which drive firms to gain a deeper understanding of market dynamics and modify their strategies accordingly (Bromwich, 1990). In this context, a conceptual framework was developed and utilized to demonstrate how competitive intensity, market volatility, and environmental unpredictability are external influences that affect the degree of SMA implementation among manufacturing firms in Nigeria. It also provided a foundation for formulating hypotheses based on the contingency theory underpinning the study.

3. Research methodology

This study utilized a quantitative research design. The design was chosen for its ability to generate numerical data that can be statistically analyzed, allowing researchers to draw generalized conclusions and test hypotheses. It focuses on measurement and objectivity, thereby enhancing the reliability and validity of findings (Creswell, 2014). Additionally, it is well-suited for studying samples and identifying patterns or relationships between variables, making it helpful in exploring causal relationships and predicting outcomes (Bryman, 2016). Furthermore, it is preferred over other designs because it assists researchers in quantifying phenomena and establishing empirical evidence through systematic data collection and analysis (Trochim & Donnelly, 2008).

3.1. Sample and data collection

The study population comprised 76 publicly listed manufacturing companies in Nigeria as of December 2023. After excluding two non-operational firms from the Nigerian Security Exchange list, the final sample has 74 listed firms. The sample size was determined using the Green (1991) formula, which suggests that the minimum sample size for a study is $50 + 8p$, where p represents the number of independent variables. In this study, three independent variables were input into the formula, and a minimum sample size of 74 was identified. However, 14 firms declined to participate in the survey, which resulted in a final sample size of 60.

The rationale for choosing the sample size is grounded in the formula established by Green (1991) in determining the minimum sample size required for regression analysis: $N \geq 50 + 8m$, where m denotes the number of predictors. This method guarantees that the study maintains sufficient statistical power to detect significant relationships among variables while reducing the likelihood of errors (Green, 1991). Given that the study population consisted of 74 firms, with 14 firms declining to participate in the survey, such a phenomenon is frequently observed in survey-based research. It can lead to discrepancies in response rates across various industries. According to the existing literature, previous studies have encountered similar non-response issues, prompting researchers to focus on the respondents who participated in the survey (Saunders et al., 2016). The final sample size of 60, close to the minimum requirement of 74, ensures adequate statistical power, especially given the number of predictors involved. Although the sample size decreased, it remains sufficiently large to prevent a significant reduction in the power of the analysis (Hair et al., 2010). For most regression analyses that involve a limited number of predictors, such as the case in this study, a sample size of at least 50 is generally considered sufficient for a robust and statistically sound analysis that can produce meaningful outcomes (Hair et al., 2010). Furthermore, typical response rates in organizational studies usually range from 35% to 40%; however, this study successfully garnered a sample of 60 from 74 firms, resulting in a response rate of approximately 81%, which is significantly higher than the average (Baruch & Holtom, 2008). While larger samples can enhance external validity, moderate sample sizes such as 60 are adequate for research targeting a homogeneous population with specific aims (Cohen, 1992).

Each firm had five respondents, resulting in three hundred questionnaires being dispatched to the respondents via their respective companies' email addresses on January 5, 2024. The collection deadline for the questionnaire was March 5, 2024, and prior to this date, four reminders were sent to the respondents. By the deadline, 210 questionnaires were received via email. Upon examination of the received questionnaires, thirty were incomplete, reducing the number of usable responses to one hundred and ninety (190), representing a usable response rate of 90.47%. The usable questionnaires were subsequently analyzed for the study.

Data collection was conducted through well-structured questionnaires administered to the respondents. The questionnaire was developed based on relevant literature and consisted of three sections. The first section focused on gathering demographic data and information about the firm's characteristics, while the second section aimed to collect data on strategic management accounting, competition intensity, market turbulence, and environmental uncertainty. The descriptions of the variables helped minimize any misinterpretation by the respondents (Pitcher,

2015). The common method bias associated with the standard survey design was mitigated (Speklé & Widener, 2018) using different Likert scale measurements (Podsakoff et al., 2003); hence, the study employed diverse scales to operationalize each of the variables. The SMA variable was measured on a 5-point Likert ranking scale distinct from those used for measuring competition intensity, market turbulence, and environmental uncertainty variables, respectively. Despite the scales being distinct for each variable, the points assigned to each choice, as denoted by the numerals, are as follows: i = 1 point, ii = 2 points, iii = 3 points, iv = 4 points, and v = 5 points. The preliminary version of the questionnaire underwent evaluation by faculty experts in questionnaire development who, following their review, provided refined feedback. The refinements included splitting some question items into two to prevent double-barrelled questions and altering the wording of items to enhance clarity. Subsequently, after incorporating the suggested modifications, the questionnaire was distributed to the target respondents, comprising chief operating officers/financial directors, chief accountants, senior accountants, management accountants, and finance managers working in the selected manufacturing firms in Nigeria.

3.2. Measures

The study employed scales that were utilized in prior studies to measure the independent and dependent variables to ensure the instrument's validity. The measurements and sources consulted are shown in Table 1 below.

Table 1. Measurements of the dependent and independent variables

SS/N	Main Variables	Measurements	Sources
1	2	3	4
1	Strategic Management Accounting		
	Costing	i. Attribute costing, ii. Life cycle costing, iii. Quality costing, iv. Target costing, v. Activity-based costing	Al-Mawali (2015), Nguyen et al. (2023)
	Strategic planning and control	i. Strategic budgeting, ii. Variance analysis, iii. Feedback reporting	Cescon et al. (2019), Cinquini & Tenucci (2010)
	Strategic decision-making	i. Strategic costing, ii. Strategic pricing, iii. Brand valuation	Cadez & Guilding (2008), Cescon et al. (2019)
	Competitor accounting	i. Competitor cost assessment, ii. Competitive position monitoring, iii. Competitor performance appraisal	Cescon et al. (2019), Pavlatos (2015)

Table 1 cont.

1	2	3	4
	Performance measurement	i. Balanced scorecard, ii. Integrated performance measurement, iii. Benchmarking	Kenisah & Carolinai (2024)
	Customer accounting	i. Customer profitability analysis, ii. Lifetime customer profitability analysis, iii. Valuation of customers as assets	Bui et al. (2020), Cescon et al. (2019)
2	Competition Intensity		
	No. of competitors	i. Very few, ii. Few, iii. Moderate, iv. Many, v. Very many	McManus (2013), Pavlatos (2015)
	Market share distribution	i. One dominant player with a significant market share, ii. Few dominant players with significant market share, iii. Market share evenly distributed among several competitors, iv. Several competitors with similar market share, v. No dominant player and the market highly fragmented	Kariuki & Kamau (2016), Pavlatos (2015)
	Intensity of price competition	i. Very low price competition, ii. Low price competition, iii. Moderate price competition, iv. High price competition, v. Very high price competition	Ngoc Phi Anh (2012), Thapayom (2019)
	Brand differentiation	i. Products are highly differentiated, ii. Some differentiation among products, iii. Moderate level of product differentiation, iv. Limited differentiation among products, v. Products are nearly identical	Nguyen et al. (2023)
	Barriers to entry	i. Very high barriers to entry, ii. High barriers to entry, iii. Moderate barriers to entry, iv. Low barriers to entry, v. Very low barriers to entry	Chongruksut (2013), Ojra (2014)
3	Market Turbulence		
	Volatility	i. Strongly disagree, ii. Disagree, iii. Neither agree nor disagree, iv. Agree, v. Strongly agree	Calantone et al. (2003), Makadok (2001)
	Uncertainty	i. Very low, ii. Low, iii. Moderate, iv. High, v. Very high	Agbejule (2005), Okoye & Nnenna (2019)

Table 1 cont.

1	2	3	4
	Complexity	i. Not complex, ii. Slightly complex, iii. Moderately complex, iv. Complex, v. Very complex	Al-Mawali (2015), Huyen (2022)
	Dynamism	i. Very stable, ii. Stable, iii. Neutral, iv. Dynamic, v. Very dynamic	Helfat & Peteraf (2003), Kandemir et al. (2006)
4	Environmental Uncertainty		
	Perceived environmental uncertainty	i. Very low uncertainty- factors are stable and predictable, ii. Low uncertainty – some fluctuations in environmental factors, but generally manageable, iii. Moderate uncertainty – factors exhibit fluctuations, requiring occasional adjustments, iv. High uncertainty – Significant fluctuations in environmental factors, necessitating frequent adjustments, v. Very high uncertainty – factors are highly volatile and unpredictable	Erserim (2012), Ngoc Hung (2023), Robson (2002)

Source: Author's variable measurements adapted from various sources.

Table 1 above shows how each of the constructs was measured. Given the measurements, indices for applying the SMA, competition intensity, market turbulence, and environmental uncertainty variables were constructed by calculating the average scores obtained for each variable from the responses obtained. The dependent variable, the SMA, was created by calculating the average responses for each variable of the SMA and summing these averages to form the index. In adhering to the assumptions of multiple regression analysis, the independent variables are supposed to be measured on an interval or ratio scale. Nevertheless, it is permissible to utilize an ordinal scale with categories ranging from 1 to 5 or more to measure independent variables, provided there is an underlying assumption that the intervals between each category are equal (Jammieson, 2004). The study employed this approach by measuring the independent variables as continuous variables during the analysis of the survey data. This methodology is crucial for accurately capturing the linear relationships; otherwise, the linearity between the independent and dependent variables may be compromised, resulting in potential misinterpretation of the findings (Tabachnick

& Fidell, 2019). Furthermore, research indicates that treating Likert-scale data as continuous can produce valid outcomes in multiple regression analysis, especially when the model and sample size are sufficiently robust (Harpe, 2015). This practice is prevalent, mainly when the ordinal variables consist of five or more categories, which closely approximate continuous measurement for various analytical purposes (Bishara & Hittner, 2012; Norman, 2010; Sullivan & Artino, 2013).

3.3. Statistical analysis

The study employed the following statistical tests to facilitate and streamline understanding. Factor loading testing assisted in assessing the variable validity and reliability, with a 0.30 threshold considered ideal (Hair et al., 2010). The Cronbach's alpha test, with a threshold of 0.70, was applied to assess internal consistency. The Kaiser–Meyer–Olkin (KMO) test was used to assess sampling adequacy. Bartlett's test of sphericity was conducted to assess the completeness of the multiple items used to measure each variable and to confirm internal consistency. The exploratory factor analysis was applied due to the large number of items used to measure each variable. Descriptive statistical tools, including frequencies and percentages, were used to determine the profiles of respondents and company characteristics. Pearson correlations, alongside variance inflation factor (VIF) tests, were performed to detect issues related to multicollinearity. The Shapiro-Wilk normality test was conducted to ensure the reliability of the statistical inferences and hypothesis testing. Furthermore, the multiple regression analysis was deployed to examine the influence of the independent variables (competition intensity, market turbulence, and environmental uncertainty) on applying SMA based on the study's research framework.

4. Research findings

The results arising from the various tests conducted are discussed. According to Table 2 below, the data indicate that the respondents' education level, work experience, and job title suggest they are very familiar with their company's operating environment and strategic management accounting system. The heterogeneous characteristics of the companies, respondents' admission of the presence of a management accounting department, and adoption of strategic management accounting in times of environmental uncertainty suggest that they understand the appropriate context for SMA application. Furthermore, the data suggest that the composition and

representativeness of the sample are sufficient (Bryman, 2016), enabling the generalization of the results to the population (Patten & Newhart, 2018).

Table 2. Descriptive statistics of respondents' profile and firms' characteristics

Panel A: Respondent profiles				
Variable	Category	Frequency	%	Total
Educational qualification	BSc/ HND	117	61.58	190
	Masters/ACA/FCA	73	38.42	
Length of experience	1-10 years	124	65.26	190
	11-25 years	49	25.79	
	Above 25 years	17	8.95	
Job title	CFO/Financial Director	26	13.68	190
	Chief Accountant	34	17.99	
	Managers	33	17.37	
	Management Accountant	40	21.05	
	Managers	57	30.00	
Panel B: Company Characteristics				
Company Location	Nigeria	190	100	190
Products are certified	Yes	190	100	190
	No	–	–	
Has management accounting department	Yes	169	88.95	190
	No	21	11.05	
Apply SMA during environmental uncertainty	Yes	190	100	190
	No	–	–	

Source: Author's own data generated from questionnaire administered.

Table 3 show that the Cronbach's alpha coefficients for all measured multi-item variables were 0.945, 0.938, 0.869, and 0.797, respectively. All the alpha values were above the recommended minimum level of 0.70, confirming variable validity (Drost, 2011; He, 2009). The KMO coefficients for the variables were 0.816, 0.803, 0.795, and 0.714. They were all higher than the recommended minimum of 0.5, confirming the adequacy of the sampling (Cerny & Kaiser, 1977), including the factorability of the variables and reliability. The results of Bartlett's test of sphericity for all the variables have a p-value of 0.00, which is less than 0.05, indicating the adequacy of the multi-item measures and confirming the instrument's internal consistency (Oyewo et al., 2022).

Table 3. Summary of validity and reliability test results

Variable	No. of items	Cronbach alpha efficient	KMO Co	Bartlett's test (p-value)
SMA application	17	0.945	0.816	.00
Competition intensity (COMPINT)	5	0.938	0.803	.00
Market turbulence (MKTTUR)	4	0.869	0.795	.00
Environmental uncertainty (ENVU)	1	0.797	0.714	.00

Source: Author's own calculation.

Table 4 below has factor loadings, bootstrap values, and t-values from the tests carried out for the variables. The factor loading is not only crucial for assessing construct validity (Brown, 2015; Kline, 2016) it also demonstrates how each observed variable accurately represents its associated latent variable (Brown, 2015). The bootstrap is helpful in evaluating the reliability and stability of the loadings (Byrne, 2016; Chin, 2010), including improving reliability (Brown, 2015). The t-value is important in determining the statistical significance of the loadings (Hair et al., 2019; Kline, 2016). As shown in Table 4, the factor loadings range from 0.85 to 0.94 and are well above the commonly accepted threshold of 0.70, indicating that the items are strong indicators and confirming the validity of the measurement model (Brown, 2015; Kline, 2016). The bootstrap values for the variables, as observed, consistently fell between 3.0 and under 4.0, indicating the stability of the loadings across the different samples, confirming their reliability, stability, and robustness (Byrne, 2016; Chin, 2010). The t-values, exceeding 1.96, validate the statistical significance of the factor loadings (Hair et al., 2019; Kline, 2016). Thus, the data presented in Table 3 enhance clarity and statistical rigor, highlighting the strength and significance of the constructs under evaluation (Hair et al., 2019).

Table 4. Summary of factor loadings, bootstrap, and t-values of variables measured

Variables and items	Item loadings	Bootstrap values	t-value
Strategic management accounting measurements:			
I. Extent of SMA application	0.90	3.76	38.17
II. Specific SMA application:			
1. Costing	0.89	3.54	32.12
2. Strategic planning and control	0.85	3.32	31.02
3. Strategic decision-making	0.91	3.79	39.09
4. Competitor accounting	0.92	3.81	41.20
5. Performance measurement	0.90	3.77	38.18
6. Customer accounting	0.88	3.52	32.09
III. Drivers of SMA application:			
1. Competition intensity	0.92	3.82	41.32
2. Market turbulence	0.87	3.47	31.23
3. Environmental uncertainty	0.94	3.97	43.16

Source: Author's own calculation.

From Table 5, the Pearson correlation coefficient of SMA application with environmental uncertainty is 0.51, the highest, followed by a correlation coefficient of 0.49 between SMA and market volatility, and then a correlation coefficient of 0.43 between SMA and competitive intensity. The correlation coefficients ranged from 0.26 to 0.51, with all values below 0.70. The dependent variable, SMA, correlated significantly with the independent variables of compe-

tition intensity, market turbulence, and environmental uncertainty at a 5% significance level, suggesting a degree of association between the independent variables and the dependent variable (Pallant, 2020), revealing that the independent variables together explained variations in the dependent variable rather than one dominant factor (Hair et al., 2019). However, there was no significant correlation among the independent variables, which reduced the risk of multicollinearity, indicating that each independent variable provides a unique explanatory power of the dependent variable (Tabachnick & Fidell, 2019).

Table 5. Pearson correlation test results of the variables

Variables	COMPINT	MKTTUR	ENVU	SMA
COMPINT	1			
MKTTUR	0.35	1		
ENVU	0.26	0.38	1	
SMA	0.43*	0.49*	0.51*	1

* Significant at 5%.

Source: Author's own calculation.

A further examination for multicollinearity was performed utilizing VIF, with the findings presented in Table 6. Typically, VIF values below 10 indicate that the variables within the regression model do not demonstrate significant multicollinearity, thereby ensuring the reliability and interpretability of the model's estimates (O'Brien, 2007; Hair et al., 2010). In this analysis, all the VIF values for the variables were below 10, confirming the absence of multicollinearity among the independent variables. Consequently, the independent variables do not exhibit a high degree of collinearity with each other, alleviating concerns regarding multicollinearity. This situation is unlikely to distort the regression results, as a VIF below 10 is generally regarded as favorable (Hair et al., 2010).

Table 6. Variance inflation factor test of the variables

Variables	Variance Inflation Factor (VIF)
COMPINT	4.92
MKTTUR	5.57
ENVU	3.84
SMA	4.29

Source: Author's own calculation.

Table 7 below illustrates the results of the Shapiro–Wilk test for normality concerning each variable. The normality assumption is essential for the reliability of statistical inferences and hypothesis testing, and it relies on the validity of the normal distribution (Field, 2013). This assumption ensures accurate predictions in regression models because it mitigates the risk of skewed or biased coefficient estimations (Hair et al., 2010). Furthermore, when data adhere to a normal distribution, the power of statistical tests is enhanced, reducing the standard errors of the estimates and leading to more reliable results (Tabachnick & Fidell, 2013). Consequently, each variable’s data underwent the Shapiro–Wilk normality test to ascertain conformity to this vital assumption of multiple regression analysis. The findings revealed the following p-values of 0.069, 0.064, 0.058, and 0.062 for the respective variables, all of which exceeded the threshold of 0.05. This indicates that the data for each variable do not significantly deviate from normality (Field, 2013; Shapiro & Wilk, 1965), suggesting that the data are approximately normally distributed (Field, 2013). Therefore, the results support the application of the data in the multiple regression analysis.

Table 7. Shapiro–Wilk normality test of the variables

Variables	Shapiro-Wilk Value	p-values
COMPINT	0.900	0.069
MKTTUR	0.887	0.064
ENVU	0.841	0.058
SMA	0.884	0.062

Source: Author’s own calculation.

According to the multiple regression test results presented in Table 8, the research model was constructed by the research framework outlined in Figure 1. The model is presented as follows:

$$\text{SMA application} = 0.0538\alpha + 0.1896\text{COMPINT} + \\ + 0.2784\text{MKTTUR} + 0.3258\text{ENVU} + \epsilon$$

According to the model, the coefficient of the coordinate at the origin (constant) is 0.0538 ($t = 2.8925$; $p = 0.0302$), competition intensity is 0.1896 ($t = 7.8025$; $p = 0.00$), market fluctuation market is 0.2784 ($t = 5.6129$; $p = 0.000$) and environmental fluctuation is 0.3258 ($t = 9.2557$; $p = 0.000$). The R^2 statistic shows that the variables of competitive intensity, market turbulence, and environmental uncertainty all combine to explain about 49.85% of the influence on the application of SMA, while other factors not included in the model, represented by the error term, ϵ , are responsible for approximately 50.15% variations in SMA application under the overall condition of uncertainty. The general significance of R^2 is illustrated by the F-statistic value of 16.1384 and the associated probability value of 0.000, suggesting that the study’s overall findings are statistically significant.

Table 8. Multiple regression test results

Variables	Coefficients	Std. Error	t-Statistic	Prob
Constant	0.0538	0.0186	2.8925	0.0302
COMPINT	0.1896	0.0243	7.8025	0.000
MKTTUR	0.2784	0.0496	5.6129	0.000
ENVU	0.3258	0.0352	9.2557	0.000
R ²	0.4985			
R-Adjusted	0.4169			
F-Statistics	16.1384			
Prob.	0.0000			

Source: Author's own calculation.

5. Discussion

The primary objective of the study was to investigate whether competition intensity has a significant influence on SMA application. Based on the results presented in Table 8 above, it is evident that the competition intensity variable has a significant positive influence on the application of strategic management accounting. The finding highlights how SMA empowers manufacturing firms in Nigeria to navigate competitive pressures by improving cost efficiency, enhancing customer focus, and enabling competitor analysis. This may not be unconnected with the fact that competition in an industry intensifies the need for robust data-driven decision-making when firms are under constant pressure to be customer-focused, placing greater emphasis on understanding customer needs and behavior, including the need to stay vigilant, identify competitors' strategies, and seek innovation and differentiation. This strategic approach may have enabled manufacturing firms in Nigeria to stay competitive while striving to achieve long-term resilience and sustainability.

Based on the finding that competition intensity exerts a significant positive influence on SMA application, it is evident that the change in competitive intensity index has a significant positive influence of about 18.96% on the application of SMA. This indicates that the greater the competitive intensity, the more Nigerian manufacturing companies apply strategic management accounting. In comparison, the result is consistent with findings reported earlier by Bui et al. (2020) and Vu Thi Quynh (2021), that competition intensity has a positive and significant influence on SMA. Similarly, it was also in tandem with recent findings of Nguyen et al. (2023), Rashid et al. (2024), and Kenisah and Carolina (2024), indicating that competition intensity has a significant positive influence on SMA application.

However, it disagrees with the finding of Ojra (2014), who reported that competition intensity has a negative influence on the application of SMA. Based on this finding, the hypothesis that competition intensity significantly influences SMA application is accepted. The finding is consistent with the principle of contingency theory, which posits that competition intensity is a significant contingency factor that influences SMA application in Nigeria. Thus, the influence of competition intensity on the application of SMA aligns with the foundational tenets of contingency theory, underscoring the notion that firms operating in a competitive landscape may adopt SMA.

The finding of the study's second aim underscores that market turbulence has a significant positive influence on the application of strategic management accounting (Table 8). It supports the important role SMA plays in helping firms navigate turbulent market conditions characterized by rapid and unpredictable changes in customer preferences, competitors' actions, changing costs, and other broader market and economic trends in Nigeria. It necessitates that manufacturing firms remain responsive, especially to shifts in demand, emerging trends, and competitor actions, and enable systematic engagement in assessing market conditions, monitoring key performance indicators, identifying emerging market trends and opportunities to make informed decisions. It provided the firms with flexibility, responsiveness, and the ability to generate useful information for analysis, interpretation, and adjustment, enabling them to remain resilient and adaptive.

According to the findings, market turbulence resulting from volatility, uncertainty, complexity, and dynamism accounts for approximately 27.84% of the positive influence on SMA application. It reveals, therefore, that changes in market turbulence may lead to a corresponding change in SMA application. The finding, when compared, is in agreement with those reported earlier by Al-Mawali (2015), Okoye and Nnenna (2019), and Pavlatos (2015). Similarly, this finding aligns with recent studies by Đỗ (2022), Huyen (2022), and Nguyen et al. (2023), which demonstrate that market turbulence has a positive and significant influence on the extent to which firms apply SMA.

However, this contradicts the findings reported by Ojra (2014), who found that market turbulence has a significant negative influence on SMA application among Palestinian firms. With this observation, the hypothesis that market instability significantly influences the application of strategic management accounting is accordingly accepted. This aligns with the principles of contingency theory, which recognizes market turbulence as a crucial factor affecting the implementation of SMA by manufacturing companies in Nigeria. Such market dynamics increase firms' demand for timely and pertinent information, rendering SMA an essential and flexible management accounting approach for maintaining compet-

itiveness and resilience. Consequently, the positive influence of market turbulence on SMA application illustrates the tenet of contingency theory that a firm's management practices should align with environmental contingencies to address turbulent market conditions.

Based on H3, the study finds that environmental uncertainty has a positive and significant influence on the application of SMA in Nigerian manufacturing firms (Table 8). The finding highlights the essential role of SMAs in helping firms manage and adapt to unpredictable external environmental conditions. Environmental uncertainty comes with immense pressure and SMA application forces manufacturing firms to emphasize flexibility and organizational agility, ensuring a long-term perspective on sustainability and resilience by closely monitoring the dynamics of competitors and market trends. The indication is that SMA provides adaptive capacities that assist firms in maintaining profitability and operational continuity in volatile times, strengthening their long-term strategic positioning and equipping them to handle future environmental uncertainties.

In this respect, the finding that environmental uncertainty has a significant positive influence on SMA application implies that a change in the environmental uncertainty index accounts for approximately 32.58% of the influence on SMA application. It implies further that the greater the environmental uncertainty in Nigeria, the more manufacturing companies are willing to apply SMA, as it provides more flexibility, responsiveness, and information sharing to deal with uncertainty. The finding, when compared, is consistent with those earlier reported by Cescon et al. (2019), Sumkaew and Intanon (2020), and Ojua (2021), which indicate that environmental uncertainty has a significant positive influence on SMA application.

Furthermore, it also aligns with recent findings reported in the works of Ngoc Hung (2023), Do and Tran (2024), and Rashid et al. (2024), which suggest that environmental uncertainty significantly influences the extent to which firms apply SMA practices. It is, however, contrary to the findings of Erserim (2012), who reported a significant negative effect of environmental uncertainty on SMA application, and those of Kenisah and Carolina (2024), who reported no significant association between environmental uncertainty and SMA application. Accordingly, the hypothesis that environmental uncertainty significantly influences the application of strategic management accounting is accepted. The finding not only aligns with the tenets of contingency theory, but it also identifies environmental uncertainty as a contingency factor that influences the application of SMA by manufacturing firms in Nigeria.

6. Conclusions

The study's results indicate that competition intensity, market turbulence, and environmental uncertainty have a significant influence on SMA application, offering a compelling narrative on how market conditions can catalyze the adoption of SMA to support a firm's operational efficiency, strategic foresight, and adaptability. The study makes several valuable contributions. First, it contributes to the understanding of how environmental factors, such as competition intensity, market turbulence, and uncertainty, drive manufacturing firms in Nigeria to apply SMA practices. Second, it reveals the situational relevance of SMA and how it can be used to make more informed decisions, mitigate risks, and capitalize on opportunities. Thirdly, by focusing mainly on manufacturing firms operating in Nigeria, the study fills a geographical and sectoral gap in SMA research. Additionally, the study paves the way for future studies to analyze further factors that may influence SMA application in other sectors and regions. Furthermore, it enriches the academic literature by linking competition intensity, market turbulence, and environmental uncertainty with SMA application.

6.1. Implications for research and practice

The findings of this study have profound implications for research in a number of ways. The adoption of the 5-item scale to measure competition intensity, market turbulence, and environmental uncertainty from prior studies allows for a nuanced evaluation of how the variables influence SMA. It marks a significant step in understanding the extent to which the variables influenced SMA. This provides a valuable tool for assessing and evaluating the influence of competition intensity, market turbulence, and environmental uncertainty on SMA in future studies in the context of manufacturing firms and other industries. Thus, it lays the groundwork for future investigations. The diversity of the study's sample, drawn from top and knowledgeable employees across the manufacturing firms, strengthens the robustness and generalizability of the findings. The study breadth offers valuable insights into SMA usage when firms are faced with different market conditions. Lastly, the empirical evidence has implications for understanding how business conditions can lead to the adoption of SMA applications.

From the practice view point, it has implications for individual firms, industry, regulators, policymakers, and practitioners. One implication is that there is a compelling need to invest in SMA practices, special training, and to incentivize SMA tools if their benefits are to be achieved. It highlights the necessity to

evolve SMA practices beyond traditional methods that are not able to improve strategic responsiveness, decision-making, risk management, and optimization of performance in challenging environments. Specifically, the implication related to competition intensity having a significant influence on SMA, is that, it can motivate firms to employ competitive position monitoring and customer profitability analysis tools to assess performance relative to competitors' performances, including identifying areas of strategic advantage. In addition, it can enable firms' to analyze competitors' pricing trends and customer acquisition costs to allow for adjusting pricing strategy, improving customer targeting, and efficient allocation of resources to products and processes with more significant growth potential.

The finding connected with market turbulence has implications for a firm's agility, precision in resource allocation, assessment of cost drivers to track product-line profitability, and monitoring of value-added activities. For instance, where product life cycles are short, an SMA tool like activity-based costing (ABC) can empower firms to identify and eliminate non-value-adding processes in the supply chain. Cost-management tools can also be deployed to streamline operations and ensure resources are deployed to high-value areas that drive growth and efficiency.

The finding arising from environmental uncertainty has implications for firms in ensuring better planning, budget preparation, forecasting, management of potential risks, and safeguarding profitability. SMA tools, such as scenario analysis, rolling budgets, and forecasts, can allow firms to model various external conditions and assess their potential impact on financial performance.

6.2. Limitations of the study and directions for future studies

The study acknowledges its limitations, including the sample size, industry examined, scope, variables studied, and geography. In specific terms, the study's sample size, although justified, is small and comprises only listed manufacturing firms in Nigeria. The industry faces unique challenges that may not be fully generalizable to other industries, as they have diverse market dynamics that may influence the applicability of SMA. The study's scope was limited to three independent variables, thereby overlooking other potentially influential factors, such as technological advancements, social and cultural dynamics, financial capacity, and organizational structure, which can influence SMA practices. The Nigerian geographical market has distinct economic and regulatory challenges compared to other regions, which may not be representative of broader African or global contexts; as such, the results obtained can only be generalized to listed manufacturing companies in Nigeria.

Future studies should aim to expand the sample size to encompass other sectors of the economy, undertake cross-sectoral analysis to reveal unique challenges and contexts that make the application of SMA different among industries and across diverse environments. It is also important that future studies consider expanding the scope by adding more independent and control variables to give room for a robust analysis and findings.

Disclosure statement

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