

COST CONTROL AND PROFITABILITY OF LISTED MANUFACTURING COMPANIES IN NIGERIA

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Citation: Ajibola H.O, Nurudeen A.O (Ph.D) & Balogun S.B (2024). Cost Control and Profitability of Listed Manufacturing Companies in Nigeria, *Fuoye Journal of Management Sciences; Volume 2, Number 1; 2024* .89-109

Abstract

Due to intense competition, high labour and other manufacturing costs, and differences in currency rates, many businesses fall short of the profitability that owners had hoped for. The alarming rate of winding up manufacturing outfit in Nigeria were linked to high cost of operation, as many businesses are unable to withstand price wars. The study investigates cost control and profitability of listed manufacturing companies in Nigeria, with reference to ten listed manufacturing businesses in Nigeria. The study employed an ex-post facto research design. Secondary data was incorporated by this study through the financial statements of the chosen firms, which entails a ten-year period (2014-2023). Descriptive statistics, correlations, and regression were employed to analyze the data. The study found that net profit margin of the selected firms is significantly affected by cost of sales and distribution cost. The study concludes that potential investors can rely on cost of sales and distribution cost in forecasting net profit margin of the selected listed manufacturing outfits. It was recommended that management of Nigerian manufacturing companies should routinely assess the production and operational costs of their companies which will in turn improve the firms' profitability.

Keywords: Cost control, Cost of Sales, Distribution cost, Net profit margin and Profitability.

1.1 Introduction

As the primary concern of the stakeholders (owners, government, workers, and communities), profitability is crucial to the sustainability of any organization and cannot be overstated. Many Nigerian businesses, especially those in the industrial sector, have not lived up to stakeholder expectations in the recent past (Godwin et al., 2019). A productive corporation is the only one that

can fulfill its obligations to its stakeholders, which include paying taxes to the government, providing dividends to shareholders, increasing wages for employees, and making investments in corporate social responsibility. The scenario for enterprises that are not lucrative will be the reverse. Prempeh (2021) specifically stated that businesses in the manufacturing sector will remain comfortable and accept average earnings when greater profits can be obtained until they comprehend the true expenses related to raw-materials used by manufacturing businesses, its effect on profitability as well as the benefits of other approaches. However, as Edom et al. (2020) point out, efficiency and profitability are not the same. The effectiveness and efficiency of cost control have a significant impact on the profitability of the profit maximization target.

Cost control describes a range of practices that management of a business employed to keep operational expenses continuously low. It covers both current and anticipated future expenses (Adamu, 2022). Another definition of cost control is that it is a method of cutting manufacturing or operational expenses to offer goods and services to customers at a cheaper price (Accounting Dictionary, 2021). Consequently, in order to effectively manage and cut down unnecessary spending, a company must maintain good cost control in an effective manner. Furthermore, cost control fosters demand in the market, which is crucial in marketplaces that are already highly competitive (Akinleye & Fajuyagbe, 2022).

Recently, a number of manufacturing companies in Nigeria have experienced unexpectedly high operational costs, which have negatively impacted their management and financial performance (Godwin, et al., 2019). The major competitive disadvantage of the majority of manufacturing enterprises can be attributed to poor infrastructure, which increased costs and compromised product quality (Akintoye, et al., 2018).

According to Akinleye and Fajuyagbe (2022), many companies in the manufacturing industries have closed down, while other prestigious firms have either bought them all out or, at the very least, merged with them. Few industrial companies that are still in business in Nigeria have been able to maintain their profitability by cutting their expenses. It is expected that every profitable venture that wants to stay in business will implement cost control strategies; this is because no business will survive if it does not put specific controls order, so as to monitor its costs and ensure that they do not exceed budgets, (Godwin, et al., 2019).

However, cost control can also include lowering cost of raw materials through employing alternative means, selling and distribution cost, finance cost (by choosing a less expensive source of finance), utility costs, professional service cost, and payroll. This means that manufacturing businesses must continuously reduce the aforementioned expenditures in order to preserve

profitability and financial viability. Thus, the main objective of this research is to evaluate cost control and profitability of Nigerian listed manufacturing outfits.

The rate of return on capital employed serves as a reference for investors. However, because of intense competition, expensive labour and other manufacturing costs, and differences in currency rates, many businesses fall short of the financial performance that owners had hoped for. All these can be attributed to the recent hyper-inflation occurring in the country. Effective manufacturing cost control becomes necessary since many businesses are unable to withstand price wars. A number of manufacturing industries are having difficulty choosing appropriate cost control measures to implement. These companies' failure to install and implement appropriate cost control measures is the cause of their reported low operation results, which in turn lowers their profitability (Akpanabia & Ozims, 2021). For instance, Onuora and Kenechukwu (2019) opined that controlling the cost of sales/production through searching for suppliers with lower price of major raw materials is also a measure which would improve firm's profitability. Prempeh (2021) further proposed that businesses in the manufacturing sector will remain comfortable and accept average earnings when greater profits can be obtained until they comprehend the true expenses related to raw-materials used by manufacturing businesses, its effect on profitability as well as the benefits of other approaches. The goal of distribution, a crucial marketing function, is to deliver the appropriate goods to the appropriate point of sale at the appropriate time and in the appropriate amount (Akeem, 2018). No matter how great your items are, they cannot be purchased if they are not available at the point of sale. This will lower sales and revenues for the business.

However, there are a number of empirical studies with various outcomes in the literature on cost control and profitability. However, some of the studies related to this study are the ones conducted by Godwin, et al. (2019), Aruna and Akinwunmi (2019), Onuora and Kenechukwu (2019), Mamidu and Akinola (2019), Fadare and Adegbe (2020), Adebawojo, et al. (2022), Akinleye and Fajuyagbe (2022), Akinleye and Fajuyagbe (2022), Oluwayemisi, et al. (2022), Fatoki and Adewale (2023) and Suleiman, et al. (2023). Majority of these related studies employed the exact amount of cost of sales, administration cost, distribution cost, salaries and wages, finance cost to measure cost control, which is not representative enough and in turn does not give adequate results. This study tends to fill this gap by measuring cost control using annual percentage change in the cost of sales and distribution cost, while examining how these changes affect the profitability (net profit margin) of the selected manufacturing companies. With all the efforts put in place by previous researchers through various recommendations on cost control, the reduction in financial performance of manufacturing companies due to inadequate cost control measures still persists. Therefore, there is

need for continuous study to be conducted on cost control and profitability of manufacturing businesses in Nigeria. The study therefore examines cost control and profitability of listed manufacturing companies in Nigeria, with specific attention to how changes in cost of sales and distribution cost affect their profitability (represented by Net Profit Margin).

The broad objective of this study is to examine how cost control affects profitability of listed manufacturing companies in Nigeria. Specifically, the study determines the effect of cost of sales on net profit margin of listed manufacturing companies in Nigeria and to evaluate the effect of distribution costs on net profit margin of listed manufacturing companies in Nigeria. In addition, the study addresses issues relating to pertinent questions emerging within the domain of the problem, such as: to what extent does cost of sales affects net profit margin of listed manufacturing companies in Nigeria? and what is the effect of distribution costs on net profit margin of listed manufacturing companies in Nigeria?

The study contributes to the existing literature through testing of the following null hypotheses:

Ho₁: Cost of sales do not significantly affect net profit margin of listed manufacturing companies in Nigeria

Ho₂: Distribution cost has no significant effect on net profit margin of listed manufacturing companies in Nigeria

This study draws the attention of management of manufacturing businesses to the need for proper management and control of costs so as to eliminate failure and its negative consequence on profitability of their respective firms.

The findings of the study will enable manufacturing firms in Nigeria to effectively implement cost control measures that will enable the firms to derive maximum benefits in managing costs components to boost profitability.

The study's conclusions help investors (institutional, individual, and prospective) identify indications from the business's cost-control initiatives that indicate the company's long-term financial performance as well as its capacity to take in and profitably utilize more investment in the company.

Even with all of the research that has been done on this subject over the years, the situation is still as confusing as it was at first. This study is an additional effort to broaden the corpus of information that scholars and researchers may refer to.

2.0 Literature Review

2.1 Profitability

Profitability, in the context of business, refers to how far a company has advanced in its field of endeavor. It includes its scale (in terms of investment and expansion), the caliber of its workforce, its goods and services, its degree of profit, and its participation in the community and social responsibility. It's frequently the starting point for determining an organization's capacity to continue as a going concern (Nwanyanwu, 2016). According to Owolabi (2017), profitability is a gauge of how well a management team uses its resources and is the capacity of a company to turn a profit on all of its commercial endeavors. An organization's profit performance is the primary factor to be taken into account while assessing its profitability.

Certain words have the same meaning, including earnings, income, and margin. Thus, the capacity to generate revenue from any commercial venture, organization, or operation is referred to as profitability. This illustrates how managers may efficiently utilize every resource on the market in order to generate profit (Odusanya, et al., 2018). For the purpose of this study, net profit margin was employed as measurement of profitability.

2.1.1 Net Profit Margin (NPM)

Net profit margin is a financial metric that indicates a company's profit in relation to its total sales, according to Palma (2019). It determines how much a company's net profit is for each Naira of sales. NPM calculates a business's net income or profit as a proportion of sales. It is the proportion of a company's or business segment's net profits to revenues. Although it is most often stated as a percentage, net profit margin can also be shown as a decimal. It shows the percentage of each dollar generated by sales that a business turns into profit (Khrawish, 2017).

According to the Security Exchange Commission (2023), one of the most crucial measures of a company's financial health is its net profit margin. A business can monitor changes in its net profit margin to evaluate the effectiveness of its present procedures and project earnings based on sales. It is feasible to compare the profitability of two or more enterprises, regardless of size, because net profit margin is disclosed by corporations as a percentage rather than a monetary value (Security Exchange Commission, 2023).

2.2 Cost Control

According to Fadare and Adegbe (2020), cost control is the management of real or predicted costs made by a firm or organization. It helps a business organization plan ahead and avoid making unnecessary purchases. To put it simply, it's the procedure that management does to assess and improve production or operations processes in an effort to control costs and keep them from going up in the future (Fadare & Adegbe, 2020).

Tomasi (2018) asserted that cost control is the process through which actual outcomes are contrasted with the benchmark in order to quantify waste and take the necessary corrective actions. It is the management of operating expenses by executive action. The goal of cost control is to hit the sales objective. Creating standards is a step towards cost control. Companies are expected to follow the guidelines.

There is much room for improvement in the administration and control of the materials utilized by commercial organizations. Due to the rapid increase in waste, a new sector for recycling and the extraction of valuable resources has emerged. Siyanbola and Raji (2013) opined that materials are wasted for a variety of reasons, including effluents, breakage, contamination, improper storage, low quality, pilfering, and obsolescence. These contribute to a rise in prices of materials and are manageable through good control and efficient working practices. Business leaders have stayed away from the more important role of giving management useful information for cost control and reduction. Most commercial enterprises employ materials (or resources) for management and control that are far from ideal. Costs have risen in each of the primary elements at varying rates due to the growing rate of waste (Siyanbola & Raji, 2013). However, it is to be noted that this study does not focus on the strategies or techniques employed by manufacturing companies to control cost, but rather on how those techniques have materialized on costs (such as cost of sales and distribution costs) incurred by the firms, which in turn is expected to have effect on the firms' profitability.

2.2.1 Cost of Sales

The cost of sales is the sum of all costs associated with creating an item or service that has been sold. A key element of a company's performance metrics is the cost of sales, which evaluates an enterprise's ability to create, acquire, and manufacture goods at a reasonable cost. The word is most commonly used by retailers (Bett & Memba, 2017). It is more common for a manufacturer to refer to it as cost of goods sold.

The numerous expenses associated with sales may be categorized into three primary groups: direct labor, direct materials, and overhead. One way to think of them is as commissions paid on a sale. The formula for calculating cost of sales is initial inventory + purchases minus ending inventory. The cost of sales is the sum of all costs associated with creating an item or service that has been sold (Chowdhury et al., 2018). Retailers are more likely to refer to expenses as "cost of sales," whereas manufacturers are more likely to use terms like "cost of goods sold." It is essential to

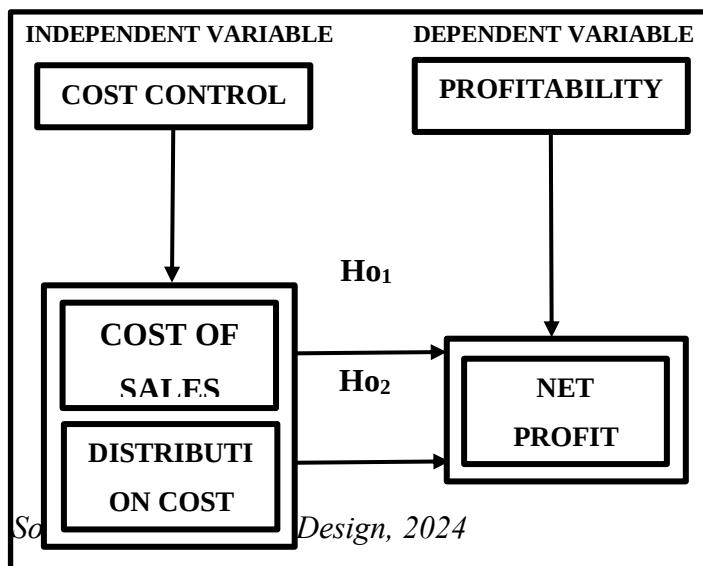
determining a company's profitability as it evaluates an organization's ability to create, procure, and produce goods at a reasonable cost (Eniola & Akinselure, 2016).

2.2.2 Distribution Costs

Castenhol (2017) defines distribution costs as all out-of-pocket expenses, which can be direct or indirect, required to guarantee the effective distribution of goods. As a result, they cover both the direct cost of activities like product promotion, order fulfillment, and shipping as well as the costs of more general management tasks like developing marketing strategies, supervising sales managers, and offering financial factor control. In accounting, distribution costs are sometimes known as sales and distribution expenses or marketing and distribution expenses. This is because, when it comes to cost categorization, marketing and distribution expenditures are typically included together in the same class (Adebawojo, et al., 2022).

Every expense made by a manufacturing company needs to be included in the financial accounts. These expenses fall into two categories: manufacturing and non-manufacturing (Hayes & Mansa, 2020). Marketing or selling expenses and administrative costs are two other categories into which non-manufacturing costs may be divided. An organization's profit is often impacted by its selling and distribution costs (Oyedokun, et al., 2019).

2.3 Conceptual Model



2.4 Theoretical Framework

2.4.1 Contingency Theory

The theoretical framework that underpins this study is the Contingency Theory. Donaldson introduced contingency theory in 2001. The theory assumes that organizational traits and the external environment must align for management strategies, especially cost management procedures, to be effective (Donaldson, 2001). Nonetheless, the contingency theory suggests that the unique features of the listed manufacturing enterprises should determine how cost management is used in this context. Depending on a number of variables, including consumer preferences, industry dynamics, competitive pressures, and firm size, cost control may or may not be beneficial in enhancing profitability. Larger manufacturing organizations, for example, could gain from cost control by using a uniform method for cost estimate, management, and analysis across several divisions or products. However, because of the uniqueness and variety of their offers, smaller businesses with more specialized goods could find it difficult to set up appropriate cost management procedures (Ochigbo & Emeti, 2019).

Akinleye and Fajuyagbe (2022) opined that the necessity of adaptability and flexibility in cost management techniques is another point made by the contingency theory. Businesses in dynamic markets like Nigeria would need to periodically assess and adapt their cost management strategies to account for shifts in input costs, currency rates, or legal requirements. Businesses may sustain cost competitiveness and boost profitability by consistently coordinating cost control with the changing market conditions. This theory was chosen because, in the context of cost control, it suggests that its application should be dependent on the unique features of Nigerian manufacturing firms.

2.4.1 Resource Based View Theory

Edith Penrose originally put out this notion in 1959. The resource-based view (RBV), according to Pearce and Robinson (2011), is a technique for assessing and determining a business's strategic advantages by looking at the unique blend of its organizational assets, competencies, and intangibles. According to this notion, profitability is impacted by elements unique to a certain organization. A business, according to Grant (2019), is a group of resources that, when combined to create organizational skills, enable it to produce profitability that is higher than normal. Businesses may build competences from these resources, and when they are developed to a high degree, they serve as the foundation for the competitive advantage of the business.

Resource-based view (RBV), according to Kapelko (2016), is the theory that makes clear how an organization's internal dynamics and profitability are related. This study's primary focus was on spending management and how it affects the financial performance of manufacturing businesses. However, one criticism of RBV is that it looks at how a firm's performance is affected by a certain resource type—intangible assets—within a particular industry.

2.5 Empirical Review

Raymond et al. (2015) evaluated cost control and corporate operational performance of Nigerian manufacturing enterprises were evaluated by. Data for the study was gathered from five (5) food-producing enterprises' annual reports and accounts. Utilizing SPSS version 20.0 and basic regression analysis, the hypotheses were assessed. The study's results show a significant relationship between profit margin, earnings per share, and cost control in Nigerian business firms.

Adesina et al. (2017) looked into how cost, sales, and marketing expenses affected profitability. 222 top management personnel, who were hand-picked from Nigerian listed manufacturing enterprises, had their perspectives subjected to descriptive and inferential statistics. According to the data study's findings, there is a significant positive correlation between the accounting information and the profitability of industrial enterprises.

Nwarogu and Iormbagah (2018) assessed the effect of indirect costs on profitability of Nigerian listed breweries, between 2010 and 2015. The secondary data gathered for the study, which employed an ex-post factor research approach, was evaluated with the use of regression analysis. The results of the regression study show that the cost of rent, salaries & wages, and administrative expenditures have a 75.5% association with profitability. The results revealed owed that rent costs have a major impact on a company's profitability, salaries and wages have no significant impact on a company's profitability, and administrative costs have a large impact on a company's profitability.

The findings indicated that rent expenses have a big influence on a business's profitability, salaries and wages have little bearing on a business's profitability, and administrative expenditures have a big influence on a business's profitability.

Mamidu and Akinola (2019) examined how performance of manufacturing companies in Nigeria are being affected by cost management. The presentation of the situation's facts involved an exploration of secondary data sources. The ordinary least square linear regression model was used to test the data. It was found that manufacturing organizations' ability to manage and control costs significantly affects profitability.

Ben-Caleb, et al. (2019) examined the relationship between cost reduction strategies and the growth of manufacturing companies in Nigeria using data from annual reports of 40 manufacturing companies quoted on the Nigeria Stock Exchange within the period of 2012-2016. The study adopted changes in material cost, changes in labour cost and changes in administrative overhead as variables for cost reduction strategies while changes in turnover as the variable for growth. Correlation and regression analysis was adopted by the study. Results from the findings showed a positive and significant relationship between cost reduction strategies and growth of manufacturing companies in Nigeria.

Leny and Sausan (2020) looked at the impact of sales and production expenses on net profit over a six-year period (2013-2018) in pharmaceutical sub-sector manufacturing businesses listed on the Indonesia Stock Exchange. The research approach used in the study is quantitative. Seven study samples were used over the course of six years to generate 42 sample units. The study's findings showed that profit is impacted by both sales and manufacturing expenses at the same time. Additionally, the analysis demonstrates that sales have little bearing on net profit and that the likelihood of manufacturing expenses has a considerable positive impact on net profit.

The impact of cost management on the financial performance of listed consumer products companies in Nigeria was investigated by Fadare and Adegbe (2020). For ten years, a sample frame consisting of ten consumer goods firms was chosen (2009 – 2018). The audited financial accounts of the chosen firms serve as the study's secondary source of data. Descriptive and inferential statistics were both employed in the study. The result demonstrated that cost control's cumulative effect on net profit margin was insignificant. On the other hand, expenses related to administration and finance have a negative impact on financial performance, but cost management proxies, such as cost of sales and distribution costs, have a favorable impact.

Oluwayemisi, et al. (2022) examined the connection between cost management and the financial performance of Nigerian manufacturing enterprises. The study specifically looked at how selling, distribution, and administrative costs affected manufacturing companies' financial performance. The study used secondary sources of data, which were gathered from 2011 to 2020 through the yearly financial reports of ten (10) sampled organizations. Descriptive statistics, panel regression (which includes the Hausman test, random effect estimation, fixed effect estimation, and pooled ordinary least squares) and correlation analysis were used to analyze the data. The study's results showed that, for the tested firms, selling and distribution expenses have a minimal positive influence on profit margin and earnings per share, while administrative costs have a negligible negative impact on both.

Fatoki and Adewale (2023) evaluated how cost control affects Nigerian manufacturing companies' survival. The research used cost of products sold, salaries and wages, and financing expenses to determine the extent to which the various cost-reduction methods succeeded in the industry. The fixed effects model in panel regression was used to examine the pay and wages, financing expenses, and cost of things sold data that were gathered from the five manufacturing companies that were chosen. The results from the analysis showed that, although manufacturing enterprises were unable to control cost of sales, but they were able to manage costs associated with salaries and wages as well as the finance cost.

Suleiman, et al. (2023) examined how cost management affects profitability of Nigerian manufacturing companies, for a ten-year period (2012–2021). A sample of one of manufacturing firm (Nestle Nig. Plc) was utilized for the study. The audited financial accounts of the selected firm provided the research with its data. To evaluate the gathered data, multiple regression was employed. The results demonstrated that administrative expenses significantly affect profitability. However, financing costs and material cost changes have a negative and little influence on Nestle Nig. Plc's profitability.

3.0 Methodology

The study utilized ex-post facto research design since the essential information was already available. From the population of sixty-six (66) listed manufacturing companies in Nigeria, the study selected ten (10) top leading firms (in terms of market capitalization) from the consumer goods sector, industrial goods sector and healthcare sector as stated by Securities Exchange Commission (2023). The study employed purposive sampling technique. The companies comprise of five (5) listed consumer goods firms (Nestle Nig. Plc., Nigeria Breweries Plc., Unilever Nig. Plc., Cadbury Nig. Plc., & Flourmills Nig. Plc.), three (3) listed industrial goods firms (Dangote

Cement Plc., Lafarge Africa Plc., & Berger Paints Plc.) and two (2) listed pharmaceutical firms (Neimeth Plc. & Fidson Healthcare Plc.). The study employed secondary data from the annual report and accounts of the firms under study, for a period of ten (10) years (2014-2023). To ascertain whether or not the acquired data are normally distributed, preliminary analysis was conducted using the Jarque-Bera test for normality. The data retrieved for this study were analyzed using both inferential statistics (correlation and regression analysis) and descriptive statistics (minimum, maximum, mean, and standard deviation).

3.1 Model Specification

To determine the combined effect of cost control on the selected firms' profitability, a model was used. Cost control, which the research defined as the cost of sales and distribution expenses, serves as a prerequisite for estimating profitability. However, Net Profit Margin serves as a proxy for profitability. The regression that was used to estimate the relationship is stated below:

$$NPM = f(COS, DC, FS) \dots \dots \dots (1)$$

This can further be written as;

$$NPM = \alpha + \beta_1 COS + \beta_2 DC + \beta_3 FS + e \dots \dots \dots (2)$$

Where;

NPM = Net Profit Margin (Dependent Variable)

COS = Cost of Sales (Independent Variable)

DC = Distribution Cost (Independent Variable)

FS = Firm Size (Control Variable represented by logarithm of total assets)

$\beta_1, \beta_2, \beta_3$ = Coefficient of Regression

e = error term

3.3 Measurement of Variables

S/N	VARIABLES	MEASUREMENT	DESCRIPTION
1.	Financial Performance (Dependent Variable)	Net Profit Margin (NPM)	Palma (2019) defines net profit margin as a <u>financial ratio</u> used to calculate the percentage of profit a company produces from its total revenue. It can be derived, thus: NPM = <u>Profit for the year</u>

			Revenue
2.	Cost Control (Independent Variable)	1. Cost of Sales	It is referred to as the sum of all expenses incurred in producing a good or service that has been sold is known as the cost of sales.
		2. Distribution Cost	It is the total of all those expenses that the producer of a product incurs to make possible the delivery of the product from its location to the end customer's location.
3.	Firm Size (Control Variable)	Logarithm of total assets	It denotes the aggregate of the net book values of all assets that an individual, corporation, or organisation possesses. It comprises of the sum of all non-current assets and current assets of an organisation.

Source: Researcher's Compilation, 2024.

3.4 *A-priori Expectations*

Under this section, the study discusses the anticipated relationship, based on the researchers' knowledge from contingency theory and findings of previous studies between the proxies of variables employed by the study.

A direct link between the dependent and independent variables is anticipated, meaning that an increase in NPM should be accompanied by an increase in COS and DC. Additionally, it is anticipated that COS and DC will significantly and negatively affect the NPM of the chosen listed companies in Nigeria.

4.0 Results and Discussions

The study starts with descriptive statistics to analyze the effect of cost control on profitability of chosen listed Nigerian manufacturing firms. To increase the validity of the results, correlation and regression analyses were performed, and a discussion of various robustness tests is included.

4.1 Presentation of Results

Table 1 Descriptive Results

	NPM	COS	DC	FS
Mean	-0.281035	0.217910	0.209300	7.661136
Median	-0.122531	0.099518	0.121818	7.784202
Maximum	7.249227	6.421500	7.016145	8.901636
Minimum	-23.48764	-0.998995	-0.998351	5.983825
Std. Dev.	2.902478	0.748285	0.777868	0.888900
Skewness	-5.157910	6.232000	6.856689	-0.290382
Kurtosis	43.28262	50.31485	60.28304	1.676797
Jarque-Bera	7204.608	9975.192	14455.85	8.700634
Probability	0.000000	0.000000	0.000000	0.012903
Sum	-28.10353	21.79101	20.93002	766.1136
Sum Sq. Dev.	834.0137	55.43305	59.90283	78.22425
Observations	100	100	100	100

Source: Results from E-view v.12, 2024

The above table reveals the results from the descriptive results which includes minimum, maximum, average, standard deviation and Jarque-Bera of the parameters. The results revealed the average value for NPM, COS, DC and FS to be -0.281035, 0.217910, 0.209300 and 7.661136 respectively. From the average value, it was obvious that among the independent variables, COS is a good predictor of the dependent variable (NPM) as it has the maximum average value of 0.217910, compared to that of DC (0.209300). The maximum values of the variables were revealed as 7.249227, 6.421500, 7.016145 and 8.901636 respectively. On the other hand, the minimum values of the variables are shown -23.48764, -0.998995, -0.998351 and 5.983825 respectively. Also, the study concluded that data collected for all the variables are not normality distributed, as the probability values (0.000000, 0.000000, 0.000000 and 0.012903) of the Jarque-Bera are less than 0.05 significant level. The values for the standard deviation were also shown as 2.902478, 0.748285, 0.777868 and 0.888900 respectively.

Table 2 Correlation Analysis

	NPM	COS	DC	FS
NPM	1.000000	-0.009663	0.061477	-0.045706
COS	-0.009663	1.000000	0.069006	0.164763
DC	0.061477	0.069006	1.000000	0.188517
FS	-0.045706	0.164763	0.188517	1.000000

Source: Results from E-view v.12, 2024

Table 2 above represents the correlation results between the adopted variables, NPM, COS, DC, and LC. From the results, it was shown that COS and FS have weak negative relationship with NPM with correlation coefficients shown as -0.009663 and 0.045706 respectively, while DC has a weak positive relationship with NPM, with a correlation coefficient of 0.061477.

Table 3 Heteroscedasticity Test (Pre-Estimation Test)

Test	Statistic	d.f.	Prob.
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Breusch-Pagan LM	93.35604	45	0.0000
Pesaran scaled LM	4.043082		0.0001
Pesaran CD	7.044302		0.0000

Source: Results from E-view v.12, 2024

Heteroscedasticity is absent, according to the pre-estimation test results in the preceding table. This can be attributed to the Breusch-Pagan LM test's p-value of 0.0000, which is less than the 0.05 level of significance. This suggests that the study's model is complies with econometric features and that the findings may be interpreted with utmost reliability and have implications for policy.

Table 4 Hausman Test

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	8.277622	3	0.0406

Source: Results from E-view v.12, 2024

From the table above, the p-value of 0.0406 can be interpreted to be statistically significant, as the value is greater than 0.05 significant threshold. Therefore, fixed effect model would be suitable for the regression analysis.

Table 5 Regression Analysis (Fixed Effect)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COS	-0.000776	0.392135	-2.101980	0.0434
DC	0.112413	0.400776	2.280489	0.0398
FS	-4.945118	1.766624	-2.799191	0.0063
C	37.58083	13.53432	2.776706	0.0067
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.671463	Mean dependent var		-0.281035
Adjusted R-squared	0.557183	S.D. dependent var		2.902478
S.E. of regression	2.818271	Akaike info criterion		5.030862
Sum squared resid	691.0108	Schwarz criterion		5.369535
Log likelihood	-238.5431	Hannan-Quinn criter.		5.167929
F-statistic	1.500368	Durbin-Watson stat		1.597044
Prob(F-statistic)	0.039435			

Source: Results from E-view v.12, 2024

The regression model's coefficient that was previously specified is included in the table above, as shown below:

$$NPM = \alpha + \beta_1 COS + \beta_2 DC + \beta_3 FS + \mu$$

It has been described as follows:

$$\text{NPM} = 37.58083 - 0.000776\text{COS} + 0.112413\text{DC} - 4.945418\text{FS} + \mu$$

The above equation shows that COS and FS have negative effect on NPM with coefficient value of -0.000776 and -4.945418 respectively, while DC has a positive effect on NPM with coefficient value shown as 0.112413. The implication of this is that if each COS and FS increases by one unit, NPM of the selected manufacturing companies will fall by 0.000776 and 4.945418 respectively, while an increase in DC by one unit, would trigger a further increase in NPM by 0.112413.

The t-calculated values of the independent and control variables (COS, DC, and FS) were also shown as 2.101980, 2.280489 and 2.799191 respectively. Each of these numbers is higher than the t-tab of 2. Additionally, their matching probability values, 0.0434, 0.0398, and 0.0063 were shown. It is feasible to classify the p-values for COS, DC, and FS as statistically significant as they are below the 0.05 significant threshold.

Furthermore, the R-squared statistic of the regression was shown as 0.671463 which means that 67.15% of the total changes in NPM can be explained by COS, DC and FS while the remainder (32.85%) can be explained by some other parameters that are not employed by this study. The variance analysis of the regression was also shown in the table above, where the key data points are the F-statistic, which was shown as 1.500368 with a probability value of 0.03945. Given that the p-value is less than the 0.05 threshold, this suggests that the model that the study developed is statistically significant. Nevertheless, the Durbin-Watson statistic result was revealed as 1.597044 which implies that auto-correlation is not present as the value is greater than 1.5. This suggests even more that the parameters are in good condition.

4.2 Interpretation of Results

4.2.1 Testing of Hypothesis

H₀₁: Cost of sales do not significantly affect net profit margin of listed manufacturing companies in Nigeria

The cost of sales (COS) t-cal value was found to be 2.101980 from the regression table previously given, and a corresponding p-value of 0.0434, which was deemed statistically significant because it is less than the 0.05 significant level. Thus, the analysis refutes the above-stated null hypothesis and affirms that cost of sales has a major effect on net profit margin of Nigerian listed manufacturing businesses.

H₀₂: Distribution cost has no significant effect on net profit margin of listed manufacturing companies in Nigeria

Additionally, the DC t-cal in the regression table is 2.280489 with a matching probability value of 0.0398, which was considered statistically significant because the p-value is likewise below 0.05 significant threshold. Consequently, the study refutes the second hypothesis mentioned earlier and reiterates that the net profit margin of Nigerian listed manufacturing businesses is significantly affected by distribution costs.

4.3 Discussion of Findings

The study examines how profitability of listed manufacturing companies in Nigeria is affected by cost control. Specifically, cost control proxies adopted were; annual percentage change in cost of sales and distribution cost. Profitability was measured with the use of net profit margin. Some of the empirical studies reviewed for the purpose of this study revealed different results while some results are related to the outcome of this study, as discussed below:

The study comes to the conclusion at 5% level of statistical significance that cost control (measured by COS) has a considerably effect on net profit margin of selected firms confirming the alignment proposition of the contingency theory. This result also goes in line with the a-priori expectation stated earlier in this study, as cost control is expected to have significant effect on profitability (measured with net profit margin) of the firms under study. This outcome is related to the findings carried out by Lasisi and Nuhu (2015), Fadare and Adegbe (2020), Oluwayemisi, et al. (2022), Robinson and Umo (2023) and Suleiman, et al. (2023), but does not relate with the outcome of Raymond, et al. (2015), Adesina, et al. (2017), Mamidu & Akinola (2019), and Leny & Sausan (2020).

Also, it was found that distribution costs has significant effect on net profit of the chosen firms, which also aligned with the assumption of contingency theory. This result corroborates with the outcome of the study conducted by Nwarogu and Iormbagah (2018), Mamidu and Akinola (2019), Fadare and Adegbe (2020), Leny and Sausan (2020), Fadare and Adegbe (2020), Leny and Sausan (2020), Oluwayemisi, et al. (2022), Fatoki and Adewale (2023), Robinson and Umo (2023) and Suleiman, et al. (2023), but does not relate to that of Raymond, et al. (2015), Lasisi and Nuhu (2015), and Adesina, et al. (2017). This outcome of the findings also meets the a-priori expectation stated earlier, as cost control significantly affects profitability.

5.0 Conclusion and Recommendations

The study comes to the following conclusion in accordance with the research findings that showed how cost control affects the profitability of listed manufacturing businesses in Nigeria:

The results showed that cost of sales had a negative effect on the chosen companies' profitability (net profit margin), with an increase in COS translating into a decrease in NPM of the chosen firms by 0.000776. The p-value of COS from the regression table was revealed as 0.0434 (significant). For this reason, the study concludes that high costs incurred by manufacturing firms do, in fact, affect their profitability. This made the study to confirm that there is a link between cost of sales and profitability of manufacturing firms in Nigeria. Also, it is obvious that cost of sales of the sampled firms is well managed and controlled, as it has significant effect on their profitability. However, potential investors can therefore rely on cost of sales in forecasting net profit margin of the chosen manufacturing outfits.

From the multiple regression table as well, the probability value for distribution cost from the table was revealed as 0.0398, which was interpreted to be statistically significant at 0.05 significance threshold. Nevertheless, the results from the findings also revealed further that if DC increase by one unit, NPM of the firms would increase by 0.112413. This study therefore concludes that distribution costs of the selected sampled firms are being properly managed as it significantly affects their profitability.

The study's findings and conclusion led to the following recommendations being made: To obtain a benefit over competitors in an inflationary economy, the study therefore suggests that management of manufacturing firms in Nigeria should routinely assess the production and operational costs of their companies by consistently using flexible budgeting on a regular period, so as to determine the variances which arises as a result of the difference between budgeted and actual costs incurred. This would enable the firms to identify and implement suitable cost savings ideas in their firms' operations.

In line with the study's findings, there is need for listed manufacturing firms in Nigeria to implement a cost-cutting strategy that promotes efficacy and efficiency of distribution costs (such as; adopting least cost method of transportation model) which will in turn enhance the profitability of the firms continuously.

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IMPACT OF ENVIRONMENTAL MANAGEMENT ACCOUNTING ON REDUCING GREEN HOUSE GAS EMISSIONS IN LOCAL GOVERNMENTS: A COMPARATIVE ANALYSIS

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Citation: Bojuwon M, Jemiseye R.A, Apalowowa D.O, Aina B.O, Suleiman T.M & Falusi I.E (2024). Impact of Environmental Management Accounting on Reducing Green House Gas Emissions in Local Governments: A Comparative Analysis, *Fuoye Journal of Management Sciences; Volume 2, Number 1; 2024 .110-125*

Abstract

This study examined a comparative analysis of the impact of environmental management accounting on reducing greenhouse gas emissions in local governments. The study measures EMA with water management accounting, energy management accounting, and biodiversity/eco-control accounting. Ikeja LGA and Lagos mainland LGAs of Lagos state were the focus of the study. PLS-SEM was employed for the study. Questionnaire was used as source of data collection. Twenty-five and thirty responses were gotten from Ikeja LGA and Lagos Mainland LGA respectively. The study indicated that Ikeja LGA has been effective in its energy management accounting with a coefficient value of 0.999 and water management accounting efforts with a coefficient value of -0.067 which has led to a reduction in greenhouse gas (GHG) emissions while its biodiversity/eco-control accounting has not been effective with a coefficient value of 0.999. Lagos mainland on the other hand has not been effective in water management accounting, energy management accounting, and biodiversity/eco-control accounting and thus, it has not contributed to reduction in the greenhouse gas (GHG) emissions with a coefficient value of 0.833, 0.043, and 0.779 respectively. The study concludes that Ikeja LGA has an effective environmental management accounting system which has led to greenhouse gas (GHG) emissions reduction while Lagos mainland LGA has not incorporated a working environmental accounting management system and thus is not assisting in reducing greenhouse gas (GHG) emissions. The study concludes that Ikeja LGA has an effective environmental management accounting system which has led to greenhouse gas (GHG) emissions reduction while Lagos mainland LGA has not incorporated a working environmental accounting management system and thus is not assisting in reducing greenhouse gas (GHG) emissions

Keywords: Environmental Management Accounting; Greenhouse Gas Emissions; Water Management Accounting; Energy Management Accounting; Biodiversity/Eco-Control Accounting.

Introduction

The local government has direct control over environmental occurrences since it is the one closest to the populace. In essence, this means that the local government can now offset any possible damage that may arise from citizen action. Nonetheless, each local government area has distinct environmental issues that they strive to address. On the other hand, greenhouse gas emissions are a nationwide environmental problem that almost all regions of the country deal with. Thus, every local government must endeavour to mitigate this challenge. As to Lamb et al. (2021), the energy sector is responsible for almost thirty percent of the greenhouse gas emissions worldwide. Industry, transportation, buildings, forestry, agriculture, and other land use (AFOLU) come next. This implies that the sorts of economic activity taking place in the region will have a significant impact on the solutions that each local government body takes to minimise greenhouse gas emissions.

Climate change is seen as the most significant environmental concern because of its consequences on society and natural resources (Yamaka et al., 2021). Growing trends in greenhouse gas emissions

(GHGs) have been associated with rising temperatures since the industrial revolution (Hegerl et al., 2019). Thus, it is well known that the main contributor to climate change—which brings about severe weather events like floods, droughts, and high temperatures—is the increase in greenhouse gas emissions (Cassia et al., 2018). Thus, via a number of indirect pathways, such as decreased access to food and water, a worsening of food shortages, sickness, violence, and relocation, GHG emissions are contributing to mortality (Perncutt, 2019). Reducing these emissions is an imperative task for all stakeholders due to their catastrophic repercussions. Several studies have looked at ways to reduce greenhouse gas emissions. The potential role of environmental management accounting in reducing greenhouse gas (GHG) emissions in Nigeria, however, hasn't received much attention (Atedhor, 2023; Adeyemi & Akinfala, 2021; Adeoti & Osho, 2012).

Specifically, with the emerging impacts on the environment and the costs involved, as well as the inability of traditional accounting systems to provide the required data to lessen these impacts and costs, EMA gains in-depth popularity (Gale, 2006; Jasch, 2006; Iredele & Ogunleye, 2017). Thus, the main objective of EMA is to provide management the information they need in order to properly assess environmental performance and costs, with an emphasis on environmental cost management. EMA helps governments and companies find areas where they may save costs and determine the actual costs associated with the environmental impact of their activities. Parker (1997) suggested that environmental management accounting can help management find ways to cut costs and estimate the true costs of projects and investments. By recognising, assessing, and allocating environmental costs, environmental management accounting can help management improve environmental management. Furthermore, companies may use EMA to include into their strategic planning the increasing expectations from stakeholders about the environmental impact of their activities. Among other things, businesses may utilise EMA to estimate the costs of implementing environmental projects and assist with product price decisions (Iredele & Ogunleye, 2017). Despite growing awareness of the effective role played by EMA in mitigating environmental challenges and costs in Nigeria, the majority of studies have focused on sectorial and firm practices, with very few focusing on governmental activities (Appah, 2011; Iredele & Akinlo, 2015; Iredele & Ogunleye, 2017; Iredele et al., 2020; Obamen et al., 2021; Ezechukwu et al., 2024). This study examined a comparative analysis of the impact of environmental management accounting on reducing greenhouse gas emissions in local governments. This study focuses on the two local governments' projects in the state of Lagos, Nigeria.

Literature Review

Environmental Accounting

The term "environmental accounting" has several different meanings. This broad branch of accounting generates reports for both internal and external audiences, assisting management in making decisions regarding pricing, capital budgeting, and overhead control as well as educating the public and financial community about environmental information that may be of interest to them. In order to provide insight into the environmental impacts and related financial effects, Steele and Powell (2002) describe environmental accounting as a cutting-edge sustainability initiative that entails the identification, allocation, and analysis of material streams and the associated financial flows through the use of environmental accounting systems. According to Leontief (1970), this accounting technique might be useful for national income accounting, internal business management accounting, and/or financial accounting. Green accounting, sometimes referred to as environmental accounting, assesses the environmental performance of a company from an economic perspective. This includes corporations and government agencies. A cost-benefit analysis is a method that weighs the economic benefits of good environmental management against the costs incurred by environmental investments in development and operations (United Nations, 1971). Environmental accounting, however, is seen by Peskin (1989) as a means of determining the unseen, indirect costs of projects and programs, for example, conserving the natural environment, enhancing human health, and preserving aesthetic values. It also ranges to wider interests, like following business practices that will ensure there is a continuation of the environment into the future. Throughout the accounting and environmental management literature, the term "environmental accounting" is predominantly used to refer to the process of providing information on environmental performance to the stakeholders outside and within an organization.

The International Federation of Accountants (1998) defines environmental accounting as "the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices." Life cycle costing, full-cost accounting, benefits assessment, and strategy planning for environmental management are often included in environmental accounting; in certain companies, reporting and auditing may also be included.

Greenhouse Gases Emission

In order to regulate Earth's temperature, greenhouse gases are necessary due to a phenomenon known as the greenhouse effect, which happens when heat from the Sun's rays is trapped in the atmosphere. environment change has occurred from excessive greenhouse gas emissions from

human activities, which have led the global temperature to rise rapidly, despite the fact that this natural process is required to maintain a habitable environment (Kweku et al., 2017).

The primary greenhouse gases responsible for this issue, according to Pooljo et al. (2015), include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and other fluorinated gases. The primary causes of carbon dioxide emissions include deforestation, industrial processes, and the burning of fossil fuels including coal, oil, and natural gas. Landfills, natural gas activities, and agricultural practices all emit potent greenhouse gases, such as methane (Kweku et al., 2017). Matthew et al. (2018) state that nitrous oxide is a powerful greenhouse gas that is primarily produced by several industrial processes and agricultural practices.

The accumulation of these greenhouse gases in the atmosphere has raised the planet's average temperature considerably, having a profound impact on ecosystems, weather patterns, and human societies. Rising temperatures are to blame for a number of effects, including the melting of glaciers and ice caps, a rise in sea level, an increase in the frequency and severity of extreme weather events, changes to precipitation patterns, and the potential for mass extinction of species (Kweku et al., 2017).

Theoretical Framework

The study is anchored in the stakeholder theory propounded by Edward Freeman (1984). Businesses must now implement an ethical and environmentally responsible business plan. This is necessary in response to the increasing demand from both internal and external stakeholders to decrease the negative environmental consequences that organisations' activities have. External stakeholders, such as investors, financial analysts, regulatory agencies, host communities, and the general public, are scrutinising the environmental operations of businesses that are under pressure to improve their environmental performance more and more (UNDSD, 2001). In addition to external obligations, the company's own financial interests may also drive the pursuit of enhanced environmental performance. Environmental expenditures account for a large portion of operational expenses for many firms, which need to be closely tracked and documented.

Therefore, the need for corporations to satisfy stakeholder requests has made the stakeholder idea—which serves as the cornerstone for EMA actions among enterprises—even more important. The core idea of the stakeholder theory is that a business's capacity to successfully navigate all of its relationships with stakeholders is what determines how successful it will be. The environmental performance of an organisation is a result of demand from a number of stakeholders, including

communities, customers, workers, and suppliers, according to Watts & Zimmerman's (1978) theory.

As a result, it upholds that companies need the backing of these stakeholders in order to function and that they must take good care of the resources entrusted to them by a coalition of different stakeholders (Chan, 1996). To get these stakeholders' support, the organisation has to ask for their consent and alter its activities (Chan, 1996). The corporation will need to adapt more the more powerful the stakeholders are.

Empirical Studies

Budiardjo et al. (2023) set out to choose methods of sustainable MSW management in Semarang City, Indonesia, as one of the ways to reduce GHG emissions. The quantification of GHG emissions due to the waste business was done according to the criteria from the IPCC. A bibliometric analysis using VOS viewer was done to ascertain the characteristics of MSWM with regard to the reduction of greenhouse gas emissions. The present situation in current management practices and suitable strategy data collection was done with the help of closed-ended questionnaires by twenty professionals. The analysis of data was done with statistical results via QSPM and SWOT analysis. A reduction in the illegal disposal of waste can bring down the total greenhouse gases 2021-2030 to 10.73 Gg CO₂-eq/year. Semarang City now needs to implement a competitive strategy that has been outlined from the set A McMullen reduction goal according to SWOT analysis matrix. Improvement in data quality management and performance of sub-district or decentralized service shall be the main strategic goal for MSW sector GHG reduction.

Oti et al. (2019) used the trend analysis to analyze the effects of the greenhouse gas emissions, carbon dioxide, methane, and nitrogen oxide released into the Ghanaian and Nigerian ecosystems together with associated accounting measures. The World Development Indicators presented the data. Results from the study revealed that the environmental accounting programs are necessary for standard setting in corporate reports in industries. Only environmental accounting reporting programs that are standardized globally are encouraged since the results would be adopted globally as a standard of reporting on environmental issues.

According to He and et al. (2017) This study examines the direct impact of LGI on CO₂ emissions reduction using panel data model, clustering analysis, and cointegration test based on Chinese data during the period of 2000–2013. The first one is that the increase of LGI usually reduces carbon emissions over the period of the sample, so influences the industrial structure and energy efficiency, whereas the effect of the former strategy is larger. The second one is that there is inertia in carbon

emissions, so the carbon emissions of the previous year influence the carbon emissions emitted the following year. Therefore, if the carbon emission reduction went well in the previous year, the next year's effect of LGI's decrease of carbon emissions will be larger. Third, LGI has different carbon emission reduction effects. For example, in some areas such as Anhui and Sichuan, the economic growth and carbon emissions are joint. Fourth, the effect of relieving carbon emissions by LGI is divided into five groups in this research among 30 provinces and municipalities according to the degree that the local government chokes off carbon emissions: strong, somewhat strong, medium, relatively weak, and weak. LGI can dramatically reduce carbon emissions in western and central China, but not in eastern or northeastern China.

Iredele and Ogunleye (2017) measured the level of practices of environmental management accounting among listed firms in South Africa and Nigeria and also established the challenges to such practices. The sample size was made up of 44 accountants; 22 from each country. Primary data was collected through a structured questionnaire. Descriptive statistics used to analyze the data collected were mean scores, frequencies, tables and percentages. It is for this reason that the study concluded that EMA processes are more available in South Africa than in Nigeria since there were 72 EMA techniques employed by businesses in South Africa compared to 41 in Nigeria. In addition, the mean scores for serious deterring factors to EMA practices in South Africa 3.5605 and Nigeria 3.4148 specify financial and institutional hindrances. This result indicates to us that the government and stakeholder in Nigeria will relate well in the formulation and enactments of environmental laws in order to avoid the firms from being apathetic to environmental issues.

According to Di Giacomo et al. (2017), the company had involved a global consulting company that made an attempt to establish an employee travel carbon emissions management application that would successfully manage environmental effects. The business had a motivation to reduce its carbon output to avoid breaking the law as well as to retain or gain responsible company status. The report considers material that is internal as well as external, senior staff interviews, and adopts a case study approach. A case study of the management of Beta how to reduce carbon emissions approach. The company concentrated on air travel despite the fact that the figures show travel preferences of personnel had not shifted significantly. There were also increases in carbon emissions from that air travel as the years went on, whereas the head office had indicated there would be a decline in the carbon emitted. After the fact, all numbers had a target reduction declared, but it was severely slashed after the fact to accommodate the real situation.

With the data of a survey questionnaire to local governments in New South Wales, Australia, Qian et al. (2015) examined the relationship between characteristics and variables which impact EMA

practices for garbage and recycling services. EMA, under the influence of organizational and social factors, can be used to address the ever-growing demands from local government for strategic management of their stakeholders. Generally speaking, institutional barriers to more general EMA use, like costs and indirect noxious effects, which are external to the user, are lower than functional demands on local governments. This suggests that the adoption of EMA in governments is considered more as an instrumental practice to overcome functional barriers and to enhance efficiency rather than an institutional necessity to persuade the citizens.

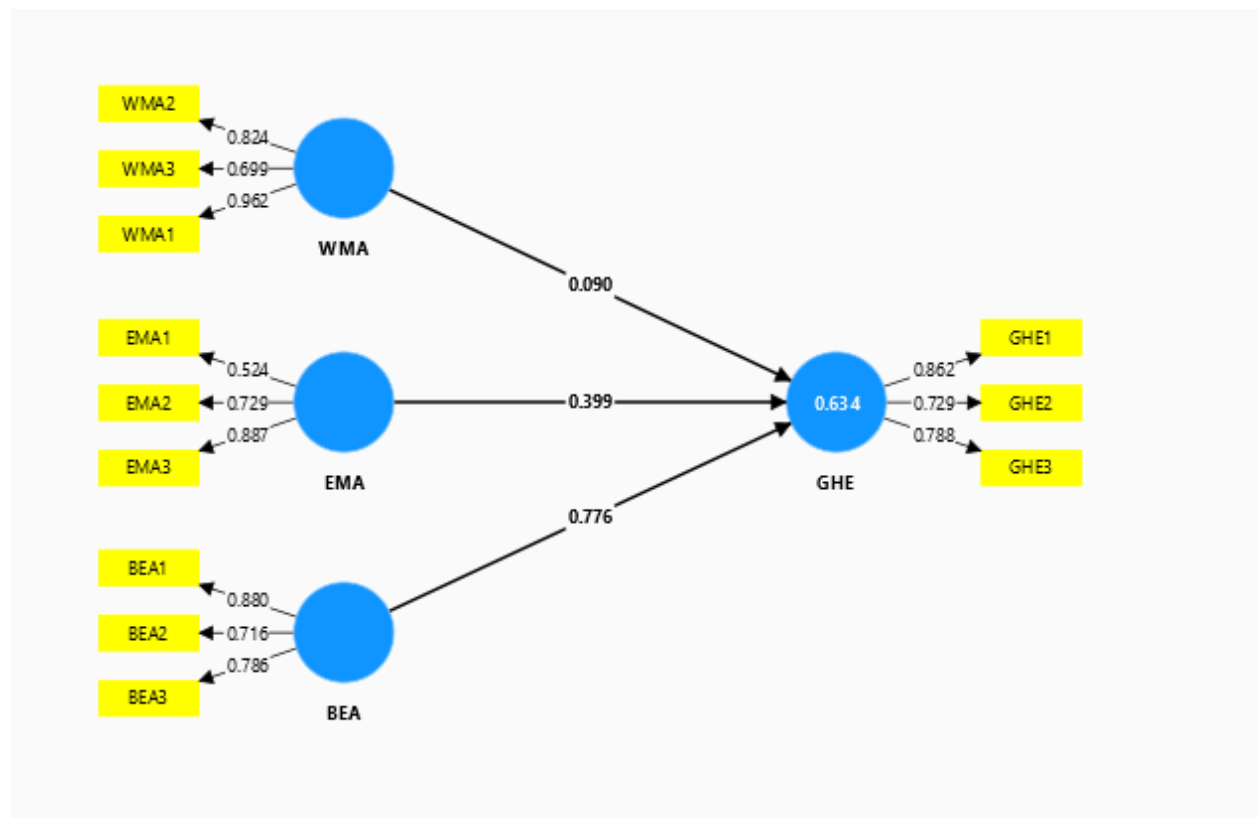
Qian et al. (2011) examined the practice state of environmental management accounting and the reasons for applying the latter. The objective was to help local authorities manage trash and recyclable better. Interviewing of the recycling and waste management managers of the respective municipal councils within the chosen local government bodies in the New South Wales region was selected to form an exploratory case study at twelve local government bodies in this specific Australian state. The study determined that the local governments investigated disclose to the public an increasing amount of environmental management accounting information. Two main factors were revealed through the case studies about the implementation of environmental management accounting in local government. The first was the influence of the organizational context that reflected the situational needs in organizational contexts, like complex waste operations and service designs, the strategic position for waste management by the council, and changes and uncertainties in waste and recycling management. The second one was the social structural influences, for instance peer council pressures, regulatory bodies, and environmental expectations of local communities.

Methodology

This study used primary data that was gathered from representatives of a sample local government using a standardised questionnaire. Two local government districts were specifically from the whole state, the LGAs were selected as they operate at the different side of the state namely mainland and highland. Twenty-five responses (response rate: 83%) and all thirty copies (response rate: 100%) of the thirty copies of the questionnaire that were issued to participating officers in Ikeja LGA and Lagos Mainland LGA respectively. Lagos Mainland respondents had a higher response rate because more people were able to fill out and submit the questionnaire on the spot. PLS-SEM was used as the main estimation technique. The study measures EMA with water management accounting, energy management accounting, and biodiversity/eco-control accounting based on the study of Mukwarami and Poll (2023).

Results and Discussion

Figure 1. Construct Validity and Reliability



Source: Authors' Computation (2024).

Table 1. Construct Overview of the Model

Variables	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)

WMA	0.709	0.720	0.838	0.634
EMA	0.744	0.704	0.765	0.531
BEA	0.719	0.781	0.837	0.632
GHE	0.815	1.528	0.872	0.698

Source: Authors' Computation (2024).

All of the constructs in Table 1 have Cronbach's alphas coefficients between 0.837 and 0.775, which are higher than the 0.70 bench coefficient. The constructs' composite reliability coefficients fall between 0.882 and 0.844, indicating that the model has good internal consistency and reliability. Comparably, the rate at which every item in the model correlates with other measures of the same concept is considered the convergent validity. The Average Variance Extracted (AVE) of each latent construct is examined in order to quantify it (Fornell & Locker, 1981). According to Chin (1998), all of the constructs showed high loading (> 0.50), which indicated that the convergent validity model was appropriate.

Table 2. Fornell-Larcker Discriminant Validity Test

Variables	BEA	EMA	GHE	WMA
BEA	0.796			
EMA	0.678	0.729		
GHE	0.776	0.399	0.795	
WMA	0.258	0.530	0.090	0.836

Source: Authors' Computation (2024).

Discriminant validity was verified by the Fornell-Larcker criterion, which says that for each latent variable, the square root of the AVE should be higher than its correlations with other latent variables. Data met the requirement of discriminant validity, as reflected in Table 2-the correlation values therein are below those of BEA, EMA, GHE, and WMA, standing at 0.796, 0.729, 0.795, and 0.836, respectively.

Table 3. Cross Loading

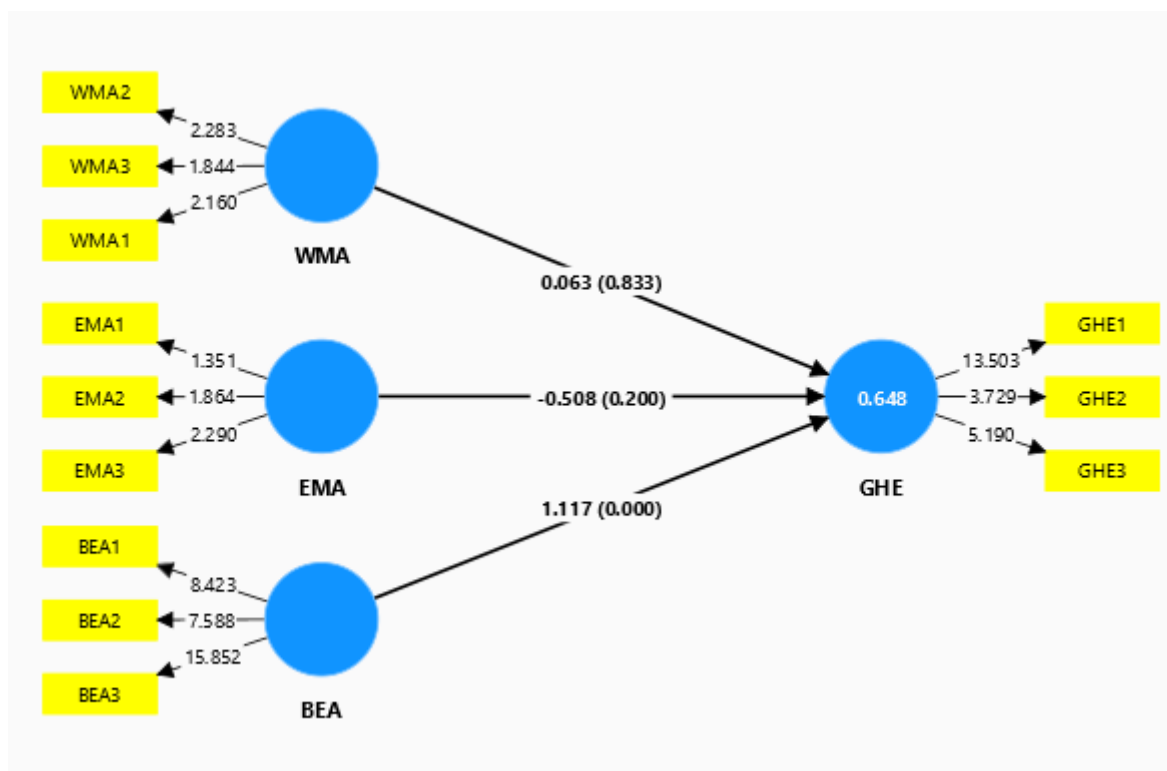
Variables	BEA	EMA	GHE	WMA
BEA1	0.880	0.497	0.644	0.178
BEA2	0.716	0.702	0.535	0.260
BEA3	0.786	0.454	0.664	0.188
EMA1	0.257	0.524	0.054	0.779
EMA2	0.409	0.729	0.250	0.546

EMA3	0.668	0.887	0.401	0.303
GHE1	0.786	0.378	0.862	0.057
GHE2	0.477	0.272	0.729	0.097
GHE3	0.511	0.279	0.788	0.073
WMA1	0.177	0.487	0.029	0.824
WMA2	0.214	0.397	0.035	0.699
WMA3	0.246	0.487	0.107	0.962

Source: Authors' Computation (2024).

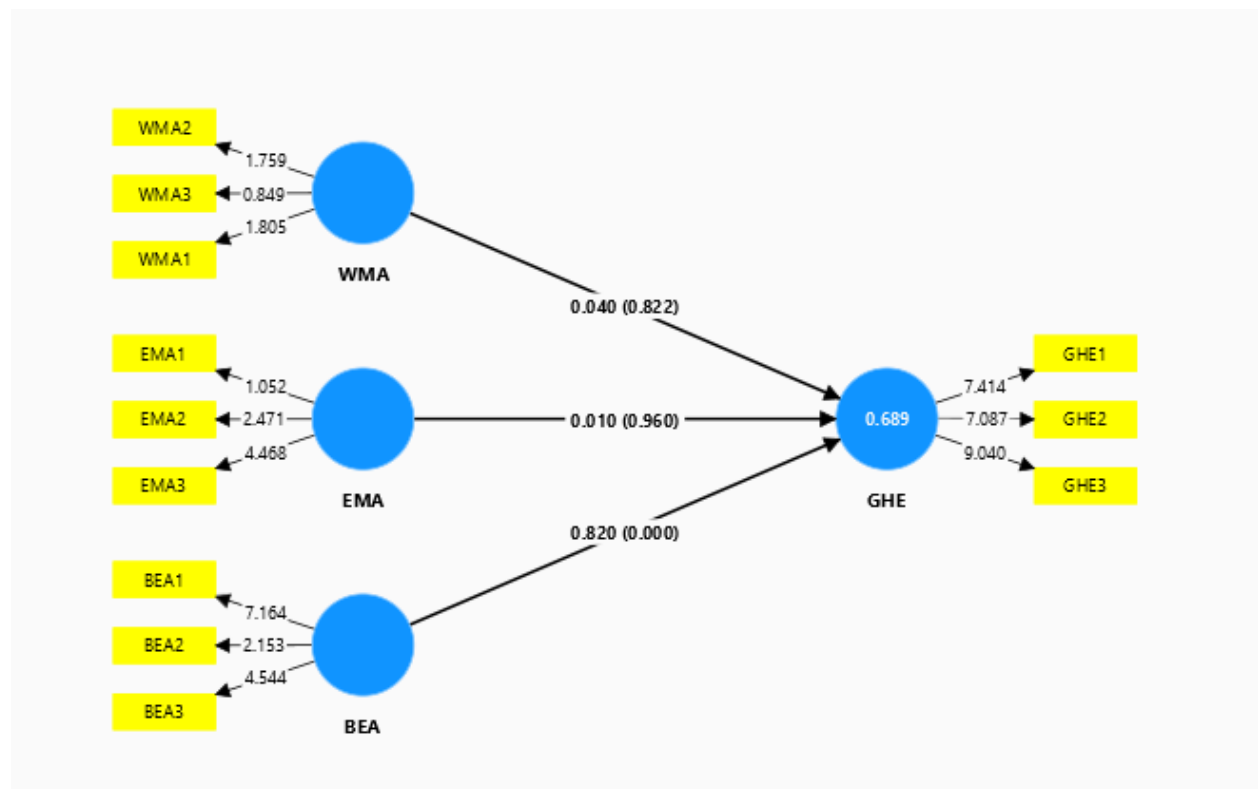
A given item should have larger loadings on its own parent construct than on any other studied construct, based on cross loadings. In Table 3, the indicator loadings are compared with those of other reflecting indicators. Most of the indicator loadings were found to be greater than the cross-loading values, indicating satisfactory discriminant validity, according to the findings.

Figure 2. The Structural Equation Model (IKEJA LGA)



Source: Authors' Computation (2024).

Figure 3. The Structural Equation Model (Lagos Mainland LGA)



Source: Authors' Computation (2024).

Table 4. Path Coefficient Statistics

	Ikeja LGA				Lagos Mainland LGA			
	Beta Value	Standard Error	T Statistics	P Values	Beta Value	Standard Error	T Statistics	P Values
BEA -> GHE	0.999	0.258	4.326	0.000	0.779	0.156	5.264	0.000
EMA -> GHE	-0.280	0.396	1.282	0.200	0.043	0.198	0.051	0.960
WMA -> GHE	-0.067	0.296	0.211	0.833	0.011	0.179	0.225	0.822

Source: Authors' Computation (2024).

Table 4 displays the findings for BEA, which are significant at the 5% level of significance. In Ikeja LGA, the coefficient value is 0.999, and the p-value is 0.000. In Lagos mainland LGA, the coefficient value is 0.779, and the p-value is 0.000. This shows that the greenhouse gas (GHG) emissions in the mainland LGAs of Lagos and Ikeja are growing as a result of biodiversity/eco-control accounting, indicating that the LGAs have not been successful in lowering GHG emissions using this method. EMA is not significant at the 5% level of significance. In Ikeja LGA, it has a coefficient value of -0.280 and a p-value of 0.200; in Lagos mainland LGA, it has a coefficient value of 0.043 and a p-value of 0.960. This suggests that the Ikeja LGA adopted an energy management accounting which has helped to reduce greenhouse gas (GHG) emissions biodiversity/eco-control accounting, while the Lagos mainland LGA has not been effective in this regard.

It also suggests that energy management accounting has an increasing effect on greenhouse gas (GHG) emissions in the LGAs of Lagos mainland and a decreasing effect on GHG emissions in both Ikeja LGAs. WMA is not significant at the 5% level of significance, with coefficient values of -0.067 and p-values of 0.833 in Ikeja LGA and 0.011 and p-values of 0.822 in Lagos mainland LGA. This suggests that the Ikeja LGA adopted a water management accounting which has helped to reduce greenhouse gas (GHG) emissions biodiversity/eco-control accounting, while the Lagos mainland LGA has not been effective in this regard. It also suggests that water management accounting has an increasing effect on greenhouse gas (GHG) emissions in both Ikeja LGAs and a decreasing effect on GHG emissions in Lagos mainland LGAs. Based on the results of the Ikeja LGA, the research by Budihardjo et al. (2023) concurs with the conclusions of this study but contradicts the Lagos Mainland LGA's findings.

1.1 5. Conclusion

The role played by environmental management accounting in the reduction of greenhouse gas (GHG) emissions in two local government areas of Lagos state were comparatively carried out in this study. PLS-SEM was used for the study, Ikeja LGA and Lagos mainland LGAs were the focus of the study. The study indicated that Ikeja LGA has been effective in its energy management accounting and water management accounting efforts which has led to a reduction in greenhouse gas (GHG) emissions while its biodiversity/eco-control accounting has not been effective. Lagos mainland on the other hand has not been effective in water management accounting, energy management accounting, and biodiversity/eco-control accounting and thus, it has not contributed to reduction in the greenhouse gas (GHG) emissions. The study concludes that Ikeja LGA has an effective environmental management accounting system which has led to greenhouse gas (GHG) emissions reduction while Lagos mainland LGA has not incorporated a working environmental accounting management system and thus is not assisting in reducing greenhouse gas (GHG) emissions. This study recommends that Ikeja LGA fully incorporate environmental accounting management while Lagos Mainland LGA start an efficient environmental management accounting.

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