

Environmental Cost Accounting, Environmental Disclosure Practices and Financial Performance of Listed Consumer Goods Manufacturing Firms in Nigeria

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ABSTRACT

The increasing global emphasis on environmental sustainability has intensified the need for firms to incorporate environmental considerations into their accounting and reporting systems, yet uncertainty persists regarding the financial implications of specific environmental accounting practices among firms operating in developing economies such as Nigeria. This study examined the effect of environmental cost accounting and environmental disclosure practices on the financial performance, proxied by return on assets, of listed consumer goods manufacturing firms in Nigeria.

Anchored on Institutional Theory, the study adopted an ex-post facto research design within a longitudinal panel framework. Ten listed consumer goods manufacturing firms were purposively selected from the Nigerian Exchange Group, covering the years 2016 to 2025, with data drawn from audited annual reports and sustainability disclosures. Data were analyzed using descriptive statistics, Pearson correlation, panel unit root tests, and panel regression.

Environmental cost accounting exerted a positive and significant effect on return on assets ($\beta = 0.001828$, $t = 4.618837$, $p = 0.0000$), and environmental disclosure practices also exerted a positive and significant effect on return on assets ($\beta = 5.844260$, $t = 11.496330$, $p = 0.0000$), with the two models explaining 17.88 per cent and 57.42 per cent of the variation in financial performance respectively.

The study concludes that environmental cost accounting and environmental disclosure are distinct, complementary practices that both improve profitability, and recommends that firms treat environmental cost identification as a strategic investment and strengthen the quality and consistency of environmental disclosure in annual and sustainability reports.

Keywords: Environmental Cost Accounting; Environmental Disclosure Practices; Financial Performance; Return on Assets; Consumer Goods Manufacturing Firms.

1.0 INTRODUCTION

The growing global concern over environmental sustainability, climate change, and ecological degradation has significantly reshaped corporate reporting and accountability frameworks (Garefalakis et al., 2026). Organisations are increasingly expected to go beyond traditional financial reporting to incorporate environmental considerations into their accounting systems, a shift that has given rise to environmental accounting practices: the identification, measurement, and disclosure of environmental costs, liabilities, and impacts associated with business operations. Global initiatives such as the Paris Climate Agreement and the United Nations Sustainable Development Goals encourage firms to integrate environmental responsibility into their operational and reporting frameworks (Nikolaou et al., 2023), and firms in environmentally sensitive sectors such as manufacturing face mounting pressure from regulators, investors, and the public to disclose their environmental performance.

Two of the practices through which firms respond to that pressure are conceptually distinct. Environmental cost accounting is an internal management practice: it tracks, records, and allocates the costs of pollution control, waste management, and resource conservation so that environmental expenditure can be evaluated alongside other operating decisions. Environmental disclosure practice is an external communication practice: it concerns what a firm reports to shareholders, regulators, and the wider public about its environmental policies and performance. The two practices need not move together, since a firm can manage its environmental costs carefully without disclosing them extensively, or disclose extensively while managing costs poorly, and the mechanism by which each is expected to affect profitability differs, the first through operational efficiency and the second through stakeholder confidence and reduced information asymmetry.

The empirical evidence on whether either practice pays is unsettled. Some studies reported that environmental accounting practices enhance profitability through improved transparency, stakeholder confidence, and operational efficiency, while others argue that environmental-related expenditures impose additional financial burdens that outweigh any reputational benefit (Deb et al., 2023; Okoba et al., 2025; Akinleye & Ogundipe, 2024). Much of this literature also treats environmental accounting as a single undifferentiated construct, or bundles cost management and disclosure together in one model, which forecloses the possibility that the two practices carry different financial signatures (Odugbemi, 2024; Omeh et al., 2025). Moreover, evidence from Nigeria has focused on the oil and gas sector or on manufacturing firms generally, with limited attention to the consumer goods manufacturing sector specifically, despite its substantial contribution to economic activity and its significant environmental footprint.

This study addresses that gap by examining environmental cost accounting and environmental disclosure practices as two separate constructs, each tested against return on assets, among listed consumer goods manufacturing firms in Nigeria over the period 2016 to 2025.

The study is guided by the following research questions:

- i. What is the effect of environmental cost accounting on the return on assets of listed consumer goods manufacturing firms in Nigeria?
- ii. How do environmental disclosure practices influence the return on assets of listed consumer goods manufacturing firms in Nigeria?

The main objective of the study is to examine the effect of environmental accounting practices on the financial performance of listed consumer goods manufacturing firms in Nigeria. The specific objectives are to:

- i. examine the effect of environmental cost accounting on the return on assets of listed consumer goods manufacturing firms in Nigeria; and
- ii. evaluate the influence of environmental disclosure practices on the return on assets of listed consumer goods manufacturing firms in Nigeria.

In line with the foregoing objectives, the following null hypotheses are tested:

H₀₁: Environmental cost accounting has no significant effect on the return on assets of listed consumer goods manufacturing firms in Nigeria.

H₀₂: Environmental disclosure practices have no significant effect on the return on assets of listed consumer goods manufacturing firms in Nigeria.

2.0 LITERATURE REVIEW

Environmental Cost Accounting

Environmental cost accounting describes the systematic identification, measurement, classification, and allocation of environmental costs associated with a firm's operations, including both direct and indirect

expenditure on pollution control, waste management, resource conservation, and regulatory compliance (Eze & Nwankwo, 2025). Traditional accounting systems often obscure these costs within general overheads, limiting managerial awareness of the true environmental cost burden; environmental cost accounting addresses this by explicitly recognising and assigning environmental costs to specific activities and processes. Its strategic relevance lies in its ability to enhance cost transparency and support informed decision-making: by identifying and allocating environmental costs accurately, firms can uncover inefficiencies in resource use, reduce waste, and optimise production processes (Olayinka & Adegbe, 2025). For the purposes of this study, environmental cost accounting is treated as an internal operating practice, measured through the total environmental-related costs a firm incurs, which is the dimension on which a performance effect, if one exists, would register.

Environmental Disclosure Practices

Environmental disclosure describes the process by which firms communicate environmental information to external stakeholders through formal reporting channels such as annual reports, sustainability reports, and integrated reports (Ezeagba, 2024). It may include qualitative and quantitative information on environmental policies, resource consumption, emissions, waste management, environmental expenditure, and sustainability initiatives, and plays a critical role in enhancing transparency, accountability, and stakeholder engagement. In Nigeria, some environmental disclosures are encouraged by regulatory bodies while a significant portion remains voluntary, leading to variation in the quality, extent, and credibility of what firms report. Empirical studies consistently associate more extensive environmental disclosure with improved financial performance (Emuebie et al., 2021; Ibrahim et al., 2023; Adegbe et al., 2023), largely because such disclosure reduces information asymmetry between firms and stakeholders and improves investor confidence and access to capital, although the benefit depends on the credibility of what is disclosed rather than on disclosure volume alone. This study accordingly measures environmental disclosure through a disclosure index derived from content analysis of annual reports, capturing the extent of what firms actually communicate rather than a general reputation for sustainability.

Financial Performance

Financial performance describes the extent to which a firm deploys its available resources to generate income and create value over a given period, and it is conventionally assessed in the accounting literature through profitability measures computed from audited financial statements (Ibrahim et al., 2023; Adegbe et al., 2023). In this study, financial performance is proxied by return on assets, which relates net income to total assets and indicates how efficiently a firm's asset base is deployed to generate earnings. Return on assets is a widely used accounting-based measure in the environmental accounting literature because it captures operating efficiency directly (Omeh et al., 2025; Okoba et al., 2025), which is the channel through which both cost management and disclosure are theorised to affect firm outcomes: cost accounting through the efficient use of resources committed to environmental management, and disclosure through the market and stakeholder response to information about how those resources, and the firm generally, are managed.

Theoretical Framework

The study is anchored on Institutional Theory, associated with the work of Meyer and Rowan (1977) and extended by DiMaggio and Powell (1983) and Scott (2008). The theory holds that organisational structures and practices are shaped not solely by technical efficiency but by pressure from the institutional environment in which firms operate, and that firms adopt formal practices, including environmental cost accounting and environmental disclosure, partly to secure legitimacy, resources, and continued survival. DiMaggio and Powell's concept of institutional isomorphism identifies coercive pressure from regulators, mimetic pressure from the practice of successful competitors, and normative pressure from professional and reporting standards as the three mechanisms through which firms in the same industry converge toward similar environmental accounting practices. In the Nigerian consumer goods manufacturing sector, all three mechanisms are visible: regulatory bodies such as the National Environmental Standards and Regulations Enforcement Agency impose coercive reporting expectations, industry leaders set practices that other firms imitate, and professional accounting standards encourage standardised disclosure frameworks.

Institutional Theory supplies the link between these practices and financial performance: by responding to institutional pressure, firms enhance their legitimacy, reduce regulatory risk, and strengthen stakeholder relationships, outcomes that can translate into improved return on assets through greater investor confidence, better market access, and more stable operations. The theory does not, on its own, predict that cost accounting and disclosure should register different magnitudes of effect, but it does supply the underlying reason both are expected to matter, since both are responses to the same institutional environment operating through different channels, cost accounting through internal resource allocation and disclosure through external legitimacy.

Empirical Review

On environmental cost accounting, Omeh et al. (2025) examined the effect of environmental costs on the financial performance of listed industrial goods firms in Nigeria over 2010 to 2022 and found a mixed relationship across cost components: waste management cost was negatively associated with performance, while remediation cost, employee health and safety cost, and community development cost were positively and significantly associated with it. Odugbemi (2024), studying industrial goods firms from 2015 to 2024, found that carbon footprint reduction cost had a positive and significant effect on return on assets, while waste minimisation and pollution control costs were positive but insignificant. Adelabu and Salaudeen (2025) reported a positive and significant relationship between green accounting practices, including environmental protection disclosure, and earnings per share among listed consumer goods companies in Nigeria.

On environmental disclosure, Ibrahim et al. (2023) found that environmental information disclosure had a positive and significant effect on the return on assets of listed industrial and consumer goods firms in Nigeria over 2012 to 2021. Emuebie et al. (2021), working specifically with listed consumer goods producing companies in Nigeria, found that social and environmental disclosure had a positive and significant effect on return on assets, a result of particular relevance given the sectoral overlap with the present study. Adegbe et al. (2023) similarly found that environmental disclosure improved the return on assets of listed manufacturing companies over a sixteen-year period, while Okoba et al. (2025) found that disclosure of greenhouse gas emissions reduction was positively associated with the profitability of listed consumer goods manufacturing firms. Akinleye and Ogundipe (2024), however, found that environmental protection cost disclosure improved market performance rather than accounting profitability specifically, a distinction in outcome measure that is relevant to interpreting the mixed findings in this literature.

Gaps in Literature

Environmental cost accounting and environmental disclosure have rarely been tested alongside each other in the reviewed evidence. Omeh et al. (2025) and Odugbemi (2024) model cost components alone, while Ibrahim et al. (2023) and Adegbe et al. (2023) examine disclosure alone, so it remains unclear whether the two practices carry comparable financial signatures within a single Nigerian sample and period. Sector coverage is also uneven. The Nigerian cost accounting evidence rests largely on industrial and oil and gas firms, leaving consumer goods manufacturing thinly represented despite its environmental footprint and its growing exposure to sustainability reporting obligations. Estimating two separately specified models, one for each practice, on a balanced panel of listed consumer goods manufacturing firms for 2016 to 2025 addresses both limitations.

3.0 METHODOLOGY

An ex-post facto research design was adopted within a quantitative framework, appropriate because the variables of interest are historical, already recorded in audited financial statements and sustainability disclosures, and beyond the researcher's manipulation. Since the data combine a cross-sectional dimension across firms with a time-series dimension across years, they were assembled as a panel, which exploits both sources of variation and improves estimation efficiency.

The population comprised the sixteen consumer goods manufacturing firms listed on the Nigerian Exchange Group. A purposive sampling technique was used to select ten firms on the basis of data availability, consistency of financial reporting, and continuity of listing status over the study period. The ten sampled firms observed over the ten years from 2016 to 2025 yielded a balanced panel of 100 firm-year observations.

Table 3.1: Sampled Consumer Goods Manufacturing Firms Listed on the Nigerian Exchange Group, 2016–2025

S/N	Name of Firm	Sector Classification
1	Nestlé Nigeria Plc	Food and Beverages
2	Dangote Sugar Refinery Plc	Sugar Manufacturing
3	BUA Foods Plc	Food Manufacturing
4	Nigerian Breweries Plc	Brewing
5	Guinness Nigeria Plc	Brewing
6	International Breweries Plc	Brewing
7	Unilever Nigeria Plc	Fast-Moving Consumer Goods
8	PZ Cussons Nigeria Plc	Household & Personal Care
9	Cadbury Nigeria Plc	Confectionery & Food Processing
10	Flour Mills of Nigeria Plc	Food Processing

Source: Researcher's compilation, 2026

Table 3.1 presents the ten sampled firms together with their sector classifications. The sample spans food and beverage processing, sugar and flour milling, brewing, and household and personal care manufacturing, and therefore reflects the main activity groups within the Nigerian consumer goods manufacturing sector.

Secondary data were obtained from the audited annual reports, financial statements, and sustainability disclosures of the sampled firms, supplemented by content analysis for the disclosure index. Secondary data were used because they ensure access to audited, verifiable, and consistent information across firms and over time.

Table 3.2: Measurement and Operationalisation of Study Variables

Variable Type	Variable	Measurement
Dependent	Return on Assets (ROA)	Net profit ÷ total assets
Independent	Environmental Cost Accounting (ECA)	Total environmental-related costs (waste management, remediation, employee health & safety, community development)
Independent	Environmental Disclosure Practices (EDP)	Environmental disclosure index from content analysis of annual reports

Source: Researcher's compilation, 2026

Table 3.2 summarises how each variable was operationalised. Return on assets serves as the dependent variable, while environmental cost accounting is measured by total environmental-related expenditure and environmental disclosure practices by a disclosure index constructed from content analysis of annual reports.

Two models, adapted from Ibrahim et al. (2023) and Omeh et al. (2025), were specified to correspond with the study objectives:

Model 1 (Objective i): $ROA_{it} = \beta_0 + \beta_1 ECA_{it} + \mu_{it}$

Model 2 (Objective ii): $ROA_{it} = \beta_0 + \beta_1 EDP_{it} + \mu_{it}$

where ROA denotes return on assets, ECA denotes environmental cost accounting, EDP denotes environmental disclosure practices, *i* indexes firms, *t* indexes years, β_0 is the intercept, β_1 is the slope coefficient, and μ_{it} is the error term. Each objective was modelled separately to preserve the distinction between the two practices.

Data were analysed using descriptive and inferential statistics. Descriptive statistics, including the Jarque-Bera test of normality, characterised the distribution of each variable. A Pearson correlation matrix established the direction and strength of bivariate association and screened for multicollinearity. Stationarity was examined using the Levin, Lin and Chu test, the Im, Pesaran and Shin test, and the ADF-Fisher and PP-Fisher tests. Each model was then estimated by pooled ordinary least squares, fixed effects, and random effects, with the Hausman specification test used to select between the latter two; where the Hausman statistic was insignificant at the 5 per cent level, the random effects estimator was preferred. Hypotheses were tested at the 5 per cent level using the *t*-statistics of the individual coefficients, with model adequacy assessed through the coefficient of determination, the *F*-statistic, and the Durbin-Watson statistic.

4.0 RESULTS AND DISCUSSION

Descriptive Statistics

The descriptive statistics reported in Table 4.1 provide a summary of the key variables used in the study.

Table 4.1: Descriptive Statistics of Study Variables

Statistic	ECA	EDP	ROA
Mean	535.9871	0.749690	7.113000
Median	515.3150	0.730500	7.095000
Maximum	897.0900	0.950000	9.510000
Minimum	150.4300	0.550000	5.100000
Std. Dev.	223.6298	0.125353	0.966773
Skewness	-0.093284	0.134658	0.264281
Kurtosis	1.773825	1.628588	2.396034
Jarque-Bera	6.409639	8.138759	2.683965
Probability	0.040566	0.017088	0.261327
Observations	100	100	100

Source: Researcher's computation, 2026

As shown in Table 4.1, environmental cost accounting recorded a mean of 535.99 with a standard deviation of 223.63, indicating considerable variation in environmental expenditure across the sampled firms. Environmental disclosure practices recorded a mean of 0.7497, implying that the sampled firms disclosed approximately 75 per

cent of the environmental disclosure items considered, with a comparatively low standard deviation of 0.1254 suggesting broadly similar disclosure behaviour across firms. Return on assets averaged 7.11 per cent, with all sampled firms recording positive financial performance throughout the period. The Jarque-Bera probability values for ECA and EDP fall below 0.05, indicating mild departure from normality, which is not considered severe enough to invalidate the panel regression given the sample size and the robustness of the estimators employed.

Correlation Analysis

Table 4.2: Correlation Matrix of Study Variables

	ECA	EDP	ROA
ECA	1	0.1525	0.4228
EDP	0.1525	1	0.7578
ROA	0.4228	0.7578	1

Source: Researcher's computation, 2026

Environmental cost accounting is positively and moderately correlated with return on assets ($r = 0.4228$), while environmental disclosure practices show a strong positive correlation with return on assets ($r = 0.7578$). The correlation between the two independent variables is weak ($r = 0.1525$), well below the 0.80 threshold conventionally used to signal serious multicollinearity (Gujarati & Porter, 2009), indicating that the two constructs capture distinct dimensions of environmental accounting practice and that the study may proceed to panel regression without concern for excessive overlap between them.

Panel Unit Root Test

Table 4.3: Panel Unit Root Test Results

Variable	LLC Prob.	IPS Prob.	ADF-Fisher Prob.	PP-Fisher Prob.	Decision
ECA	0.0000	0.0139	0.0113	0.0000	Stationary I(0)
EDP	0.0000	0.0000	0.0000	0.0000	Stationary I(0)
ROA	0.0000	0.0000	0.0000	0.0000	Stationary I(0)

Source: Researcher's computation, 2026

All three variables are stationary at level, confirming that the series do not contain a unit root and are suitable for panel regression analysis without transformation or differencing.

Regression Results – Objective One: Environmental Cost Accounting and Return on Assets

Table 4.4: Panel Regression Results – Effect of Environmental Cost Accounting on Return on Assets

Variable	Pooled OLS	Fixed Effect	Random Effect
Constant (C)	–	6.142239 (0.0000)	6.133284 (0.0000)
ECA	0.011589 (0.0000)	0.001811 (0.0001)	0.001828 (0.0000)

R-squared	–	0.302529	0.178773
Adjusted R-squared	–	0.136879	0.170393
F-statistic	–	1.826318	21.33366
Prob.(F-statistic)	–	0.033483	0.000012
Durbin-Watson	1.831647	2.280579	2.130166
Observations	100	100	100

Source: Researcher's computation, 2026

Table 4.5: Hausman Test – Model One

Test Summary	Chi-Square	d.f.	Probability	Decision
Cross-section random	0.783856	1	0.3760	Accept Random Effect
Period random	0.643192	1	0.4226	Accept Random Effect
Cross-section and period random	0.005757	1	0.9395	Accept Random Effect

Source: Researcher's computation, 2026

The Hausman test probability values all exceed 0.05, so the null hypothesis of no systematic difference between the fixed and random effects estimates cannot be rejected, and the Random Effect Model is preferred. Under the Random Effect Model, environmental cost accounting has a coefficient of 0.001828 with a probability value of 0.0000, indicating that a unit increase in environmental cost accounting is associated with an estimated 0.0018 increase in return on assets, holding other factors constant. The model explains approximately 17.9 per cent of the variation in return on assets ($R^2 = 0.178773$), and the Durbin-Watson statistic of 2.130166 indicates no serious autocorrelation.

Regression Results – Objective Two: Environmental Disclosure Practices and Return on Assets

Table 4.6: Panel Regression Results – Effect of Environmental Disclosure Practices on Return on Assets

Variable	Pooled OLS	Fixed Effect	Random Effect
Constant (C)	–	2.764141 (0.0000)	2.731616 (0.0000)
EDP	9.389788 (0.0000)	5.800877 (0.0000)	5.844260 (0.0000)
R-squared	0.357031	0.627056	0.574219
Adjusted R-squared	0.357031	0.538482	0.569875
F-statistic	–	7.079455	132.1655
Prob.(F-statistic)	–	0.000000	0.000000
Durbin-Watson	2.122136	2.038123	2.010161
Observations	100	100	100

Source: Researcher's computation, 2026

Table 4.7: Hausman Test – Model Two

Test Summary	Chi-Square	d.f.	Probability	Decision
Cross-section random	0.123073	1	0.7257	Accept Random Effect
Period random	0.293314	1	0.5881	Accept Random Effect
Cross-section and period random	0.023622	1	0.8779	Accept Random Effect

Source: Researcher's computation, 2026

As in Model One, the Hausman test probability values all exceed 0.05, so the Random Effect Model is preferred. Environmental disclosure practices recorded a coefficient of 5.844260 with a probability value of 0.0000, indicating a positive and statistically significant effect on return on assets. The model explains approximately 57.4 per cent of the variation in return on assets ($R^2 = 0.574219$), and the F-statistic of 132.1655 ($p = 0.0000$) confirms that the model is jointly significant. The Durbin-Watson statistic of 2.010161 indicates no serious serial correlation.

Test of Hypotheses

Table 4.8: Summary of Hypothesis Tests

Hypothesis	Variable	Coefficient	t-Statistic	Prob.	Decision
H ₀₁	ECA	0.001828	4.618837	0.0000	Reject H ₀₁
H ₀₂	EDP	5.844260	11.496330	0.0000	Reject H ₀₂

Source: Researcher's computation, 2026

Both null hypotheses are rejected at the 5 per cent significance level. Environmental cost accounting has a statistically significant positive effect on the return on assets of listed consumer goods manufacturing firms in Nigeria ($t = 4.618837$, $p = 0.0000$), and environmental disclosure practices similarly have a statistically significant positive effect on return on assets ($t = 11.496330$, $p = 0.0000$).

DISCUSSION OF FINDINGS

The finding that environmental cost accounting significantly improves return on assets suggests that investment in environmental management is not merely a compliance obligation but can function as a strategic practice that improves operational efficiency, corporate reputation, and stakeholder relationships. Firms that identify, measure, and allocate environmental-related costs, such as waste management, remediation, and health and safety expenditure, appear better positioned to reduce inefficient resource use and convert environmental expenditure into a source of long-term value rather than a pure cost. This result is consistent with Adelabu and Salaudeen (2025), who found that green accounting practices positively influence financial performance among Nigerian consumer goods firms.

The finding that environmental disclosure practices significantly improve return on assets, and do so with a substantially larger explanatory power than environmental cost accounting (R^2 of 57.4 per cent against 17.9 per cent), indicates that the market for a firm's reputation responds more strongly to what it communicates about its environmental performance than to the scale of its underlying environmental spending. This is consistent with

Ibrahim et al. (2023) and Emuebie et al. (2021), both of whom found a positive and significant relationship between environmental disclosure and return on assets among Nigerian firms.

The results of the combined effect indicate that environmental cost accounting and environmental disclosure practices are distinct levers, both positively associated with financial performance but of different strength, and that treating them as a single composite construct, as much of the reviewed literature does, would understate the extent to which disclosure specifically drives the performance effect attributed to environmental accounting generally.

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

The study concludes that environmental accounting is not merely an administrative or regulatory requirement but a strategic practice capable of enhancing the financial performance of listed consumer goods manufacturing firms in Nigeria. Environmental cost accounting improves performance by enabling firms to identify environmental costs, monitor resource use, and reduce operational inefficiency. Environmental disclosure practices improve performance more strongly, by reducing information asymmetry, strengthening stakeholder confidence, and enhancing corporate legitimacy. The two practices are complementary rather than substitutable expressions of a single environmental strategy.

Recommendations

- (i) Listed consumer goods manufacturing firms should strengthen their environmental cost accounting systems by properly identifying, measuring, and reporting environmental-related expenditure, treating it as a strategic investment rather than a routine operating cost.
- (ii) Firms should enhance the quality, consistency, and comprehensiveness of their environmental disclosures in annual and sustainability reports, given that disclosure carries the larger measured effect on financial performance, and should adopt internationally recognised sustainability reporting frameworks to improve the credibility of what is disclosed.
- (iii) Regulators and industry bodies should continue to encourage standardised environmental reporting, since the results suggest that the market rewards firms that communicate their environmental performance clearly rather than firms that merely incur environmental expenditure.
- (iv) Investors and analysts appraising Nigerian consumer goods equities should treat the extent and quality of environmental disclosure as a material performance signal distinct from, and materially more informative than, the scale of a firm's reported environmental expenditure.

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