SUSTAINABLE INNOVATION AND BUSINESS GROWTH OF SELECTED DEPOSIT MONEY BANKS IN LAGOS STATE, NIGERIA

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Abstract: *Sustainable innovation is the combination of green and flexible practices that leads to sustainable business growth. In this study, the effect of this on Deposit Money Banks (DMBs) in Lagos Mainland, Nigeria was studied using Institutional and Stakeholder Theories. The study investigated the effect of regulatory issues, digital banking, green financial products, and employee engagement on profitability, efficiency, and customer loyalty. The Structural Equation Modelling (SEM) was used to analyse data of 216 bank employees. The results indicated that digital banking enhanced operational efficiency, whereas green financial products increased the level of customer loyalty. Engaged employees contributed positively to the profitability and significantly to no significant effect on efficiency, and negatively correlated to loyalty. Profitability was also determined by the regulatory issues. There was robust predictive power as the model was able to explain 81.1% of customer loyalty and 64.0% of operational efficiency. The research added to empirical evidence within a developing economy and recommended that banks should approach innovation at strategic levels to meet the expectations of stakeholders to steer the growth of business.*

Keywords*: Sustainable Innovation, Digital Banking, Green Finance, Employee Engagement, Business Development, Deposit Money Banks, Nigeria.*
JEL Classification*: M10.*

1. Introduction

Sustainable innovation is progressively turning to be a business success factor, as business organisations are now combining environmental and social interests into their operations plans in order to experience both financial expansion and environmental ecosystem conservation (Ellen MacArthur Foundation, 2019). The Deposit Money Banks (DMBs) are one of the key aspects of enhancing economic growth and financial inclusion in Nigeria (Chiefajugwe, 2019). Following the trends in the world, the Central Bank of Nigeria (CBN) adopted Sustainable Banking Guidelines in 2019 that promoted green finance and socially responsible activities among the DMBs (CBN, 2019). Innovation in technology, such as mobile banking, blockchain and others, has also boosted efficiency and customer experience to ensure customer loyalty and profitability (Iwedi, 2024; Uddin & Rahama, 2023).

Nevertheless, DMBs have difficulties adopting sustainable innovations. The common barriers are economic instability, poor infrastructure, poor regulation and unwillingness to adapt (Adebayo & Eze, 2023; Nwankwo & Adeniyi, 2019). Also, the presence of informal financial systems erodes confidence in formal banking, hence inhibiting customer-oriented innovations (Ogunbayo, 2020). The current literature has emphasized sustainability, but there has not been much research establishing a relationship between sustainability and business performance, such as customer loyalty, financial growth and employee engagement in Nigeria. This is facilitated in this study by examining the impacts of green financial products,

digital banking, and employee involvement on the growth of business in Nigerian DMBs, as well as a discussion of important barriers to implementation.

Statement of the Problems

The problems surrounding the adoption of sustainable innovations in Deposit Money Banks (DMBs) in Mainland Lagos, Nigeria, continue, even in the era of a greater focus in the world on the need to achieve banking and corporate responsibility through sustainable innovations (Geovanna et al., 2022; Kandasamy et al., 2022; Kneipp et al., 2019). These challenges encompass poor regulations and government controls, unstable economy, poor digital infrastructure, and low participation of workers (Adewole et al., 2024; Adebayo & Eze, 2023; Awoniyi, 2022; Aduaka & Awolusi, 2020). Most DMBs find green technologies and digital banking non-viable in terms of finances and worsened by the infrastructural challenges like unreliable electricity and poor internet connectivity (Kala, 2023). Despite the evidence that green products and digital services boost both profitability and levels of customer satisfaction and employee motivation, little evidence establishes their strategic effect on business growth in the Nigerian banking industry (Nimitha & Goveas, 2024; Khushbu & Agarwal, 2024).

This research addressed this gap by investigating the effects of sustainable innovations such as green financial products, digital banking adoption, employee engagement, operational efficiency, long-term profitability, and overall business growth within the context of technological, economic, and human resource limitations within Nigerian DMBs.

Objectives of the Study

i. Identify the key barriers to sustainable innovation adoption and their effect on the perceived long-term profitability of the selected Deposit Money Banks (DMBs) in Mainland Lagos.
ii. Investigate the effect of digital banking adoption and operational efficiency in selected deposit money banks (DMBs) in Mainland Lagos.
iii. Assess the relationship between green financial products such as green loans, eco-friendly investments and perceived customer loyalty of the selected Deposit Money Banks (DMBs) in Mainland Lagos.
iv. Examine how employee engagement in sustainable initiatives moderates the relationship between sustainable innovation and business growth of the selected Deposit Money Banks (DMBs) in Mainland Lagos.

Research Hypotheses

$H0_1$: Regulatory challenges and economic volatility are not the major hindrances to sustainable innovations adoption in the selected Deposit Money Banks (DMBs) and these barriers do not affect the perceived long-term profitability of these banks

$H0_2$: Digital banking adoption has no significant effect on the operational efficiency of the selected Deposit Money Banks (DMBs) in Mainland Lagos

$H0_3$: There is no significant relationship between green financial products such as green loans, eco-friendly investments and perceived customer loyalty in the selected Deposit Money Banks (DMBs) in Mainland Lagos

$H0_4$: Employee engagement in sustainable initiatives does not significantly moderate the relationship between sustainable innovation and the business growth of the selected Deposit Money Banks (DMBs) in Mainland Lagos

2. Literature Review

Concept of Sustainable Innovation

Sustainable innovation launches new ways to tackle environmental and social issues while strengthening economic activities (Rennings, 2000). This methodology connects business growth with environmental care, social duties, and profitable operations. A recent study confirms that customers desire business sustainability, pushing employers to deliver products that match this demand. For instance, banks improve sustainability through new financial and digital offerings that benefit underserved communities and create better access which drives resource efficiency and social progress (Ojo et al, 2021).

Banks in Nigeria boost their market position and match worldwide practices through sustainable methods like providing renewable energy financing and teaching people about money management (Akinpelu & Adebayo, 2022). The Central Bank of Nigeria leads banks to adopt lending techniques and invest in areas that protect the environment and contribute to social development through its 2020 regulations. Studies indicate sustainable innovation helps banks maintain more loyal customers and improve their brand value since people now seek sustainable financial services (Eze et al., 2022). Sustainable innovation represents both a mandate from regulatory bodies and a chance for Nigerian banks to grow their business while helping the nation improve.

Barriers to Sustainable Innovation Adoption in Nigerian Deposit Money Banks

The regulatory uncertainties, economic volatility, and poor technological constructions act as considerable obstacles to the use of sustainable innovations amongst Nigerian Deposit Money Banks (DMBs) (Adebayo & Eze, 2023; Uddin & Rahman, 2023). The implementation of Sustainable Banking Principles (SBPs) has been introduced by the Central Bank of Nigeria, but due to the absence of regulatory clarity, implementation is inconvenient, especially in the case of smaller banks that are not used to sustainability principles (Uddin & Rahman, 2023). The instability of the economy, which is shown by inflation, unstable exchange rates, and unstable interest rates, further deters making long-term green investments (Khan et al., 2021). Furthermore, some banks fail to migrate into using sustainable banking digital capacities, including mobile banking, paperless transactions, or energy-efficient platforms, because of a weak internet connection, unreliable electricity, and high maintenance/upgrade charges (Kala, 2023; Kandasamy et al., 2022). It is important to overcome these obstacles by offering clarity on policy, economic changes and investment in technology so that DMBs can work towards their long-term sustainability and profitability objectives.

Employee Engagement in Sustainable Initiatives

Engagement of the employees is crucial in the accomplishment of sustainability objectives and implies cognitive awareness, emotional devotion, and operational efforts (Genghini, 2023; Robinson et al., 2021). At a cognitive level, the employees will understand the relevance of sustainability in their occupation; at an emotional level, they can feel personally accountable (Peattie & Belz, 2010; Khan et al., 2021). Behaviourally, they can take actions in the form of energy saving, reduction of wastes and participation in training (Adebayo & Eze, 2023). This engagement is enhanced by training, which is also observed within the case of Hong Kong (Law, Hills, & Hau, 2015). Productive and motivated employees enhance productivity, save money, and make customers develop trust in them, particularly in the sphere of banking (Kandasamy et al., 2022).

Sustainable Innovation Practices in Nigerian Banks

Digital Banking

Digital banking reformulates conventional financial services as convenient and web-based applications that allow customers to access a bank anywhere safely and cheaply (Malyshev, 2023). Mobile banking and, in particular, digital wallets in Nigeria have contributed to financial inclusion, and technologies such as ATM, USSD, agent banking, and neo-banks have helped to maximise access in all parts of the country (Central Bank of Nigeria, 2020; Akinpelu & Adebayo, 2022). Agents and neo-banks are for no-networked territories, but Pay Stack and Flutterwave have created safe digital transactions that enhance the digital economy (Ojo et al., 2021).

Green Finance Product

Green financial products: green loans, bonds, and insurance of environmental input projects confirm a central region of sustainability innovation that banks in Nigeria currently actively exploit. In response to the CBN Sustainable Banking Guidelines that were issued in 2019, such institutions as Access Bank or First Bank have also launched green loans, focusing on the areas of solar energy, sustainable agriculture, and green infrastructure, with typically favourable terms, such as low rates and grace periods (Access Bank, 2020; First Bank, 2021; Adebayo & Eze, 2023). The latter are green bonds and green insurance, such as those which can be listed on the FMDQ Securities Exchange (Adewole et al., 2024). Inspired by the increased understanding of environmental issues and the fact that environmental awareness is a significant focus among the majority of Millennials and Gen Zers, banking companies such as GTBank and Access Bank are broadening their green products to satisfy the needs of ESG-like customers, increase brand loyalty, and attract sustainable investments both locally and globally (Nielsen, 2015; World Economic Forum, 2020).

Concept of Business Growth

Business growth is simply a performance measure indicating the development of the firm in terms of growth in operations, customers, and revenue (Seclén, Navarrete & Sansores, 2016). In the case of banks, they develop their growth through the factors of product innovation, customer satisfaction, and operational efficiency. Customers will spend and borrow certain amounts of money using economic conditions as their guide (Oniore & Okoli, 2019). By providing sustainable lending services such as green loans, banks facilitate growth because they generate higher profitability and decreased risk (Hannon et al., 2021; Adebayo & Eze, 2023). Greater productivity and customer satisfaction are achieved due to efficiency during operation, such as through reduced costs and motivated employees (Exactbuyer, 2024). Nigeria is also experiencing an enhancement in utilisation of digital banking, which is contributing to growth and expansion in reach, lower costs and a higher customer base loyalty (Adewole et al., 2024; Ogbonna et al., 2024). The customer loyalty and profitability in the long term are boosted by delighted customers who interact with sustainable and digital services as depicted by retention rates and Net Promoter Scores (Fornell, 2020; Ndugbe et al., 2022).

Theoretical Framework

Institutional Theory

A theory by Meyer and Rowan in 1970s and extended by DiMaggio and Powell (1983), institutional theory describes how organisations adjust to societal norms, regulatory and stakeholder standards in order to gain legitimacy. According to Scott (2001) and Nga &

Tam (2024), organisations such as banks engage in sustainability practices because there are entities that force them to do so regardless of the economic and infrastructural challenges. Researchers such as Lounsbury (2007) and Hsu et al. (2013) demonstrate how organisations react to these pressures by coming up with new strategies through which they improve competitiveness. Nonetheless, Haveman (1993) criticises the theory due to the neglect of the role played by innovation in independently influencing the organisational behaviour, especially the developing nations such as Nigeria. However, the Institutional Theory is still applicable in addressing how Deposit Money Banks (DMBs) in the Nigerian banking system can participate in the sustainability initiatives as dictated by the societal and regulatory pressures and also utilise innovative ideas to meet the implementation challenges.

Stakeholder Theory

The introduction of the Stakeholder Theory by Freeman (1984) implies that organisations should look at expectations of all stakeholders, prior to acting. The introduction of green financial products in the cases of Nigerian DMBs (sustainable investments and eco-loans) reflects the fact that they respond to emerging environmental concerns and customer needs. Banks can also improve trust and loyalty by matching the interests of customers who care about the environment, in particular with financial services (Nga & Tam, 2024; Ndugbe et al., 2022). Nevertheless, critics, such as Harrison et al. (2015), also blame the theory on the inability to clarify how to prioritise among competing stakeholder interests, i.e. how to reconcile profitability with environmental responsibility. This limitation notwithstanding, Stakeholder Theory provides practical value in elaborating how DMBs may generate loyal and satisfied customers on sustainability-related financial innovations.

Conceptual Model

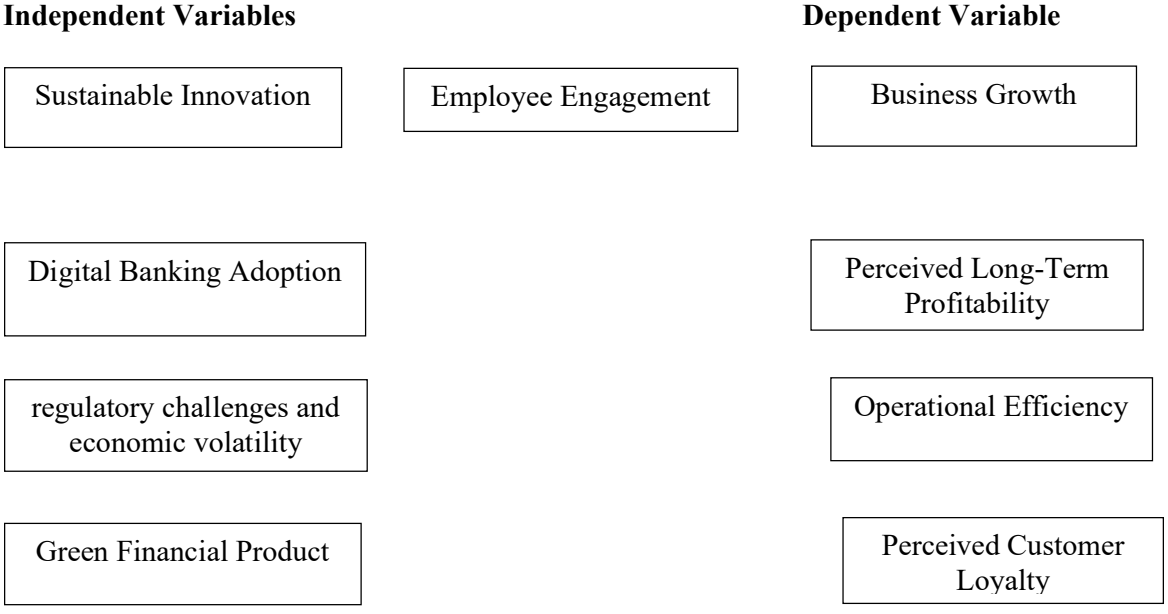

Figure 1. Researcher Conceptual Model

The model shows the relationship between sustainable innovation (independent variable), business growth (dependent variable), with employee engagement in sustainable initiatives as a moderating variable. The model proposed sustainable innovation, like barriers to adoption, digital banking adoption, and green financial product influences business growth in the form of perceived long-term profitability, operational efficiency, and perceived customer loyalty. Employee engagement in sustainable initiatives serves as a moderating variable between sustainable innovation and business growth.

Empirical Review

Sustainable Innovation and Business Growth

A body of literature reports a positive connection between sustainable innovation and organisational performance, usually on a small scope. Research like the one by Giovanna et al. (2022) emphasises human capital, overlooking the interactions of HR and stakeholder management in their overall impact. Kneipp et al. (2019) replicated the same findings in Brazil, although it had low generalisability. Liu et al. (2024) associated green innovation with environment-oriented rewards, yet ignored regulation and long-term economic costs. Manasseh (2024) demonstrated the effectiveness of technological innovation in banking in emerging economies and did not take into consideration the factors of socio-economic variances. Raman & Pickering (2025) considered financial and regulatory obstacles; they did not check the local social barrier. Saygili et al. (2022) researched ESG in Turkey, yet they did not find qualitative expertise. Obiekwe et al. (2020) focused on digital banking instruments in Nigeria and lacked the sustainability of practices. Predominantly, the current literature is limited to holistic, contextual and future-oriented perspectives; particularly concerning cultural, technological, and regional aspects of emerging economies.

Effect of Regulatory Challenges and Economic Volatility on Perceived Long-Term Profitability

The studies have proved the fact that excessive regulation combined with economic uncertainty and poor technology infrastructure burdens the profitability of Nigerian Deposit Money Banks (DMBs). Osakwe et al. (2022) discovered in their research that Central Bank of Nigeria regulations helped support bank stability but created higher operating costs while limiting loans, which damaged profitability. The research team used secondary statistics from 2000 to 2018 taken from CBN Statistical Bulletin to analyse Return on Assets (ROA), Turkey's Monetary Policy Rate (MPR), Treasury Bill Rate (TBR), Lending Rate (LR), and Cash Reserve Ratio (CRR) values. According to their model, banks need to pay more to operate and cannot make as many loans when limits like high interest rates and reserve requirements are enforced. The results confirm the work of Oladejo et al. (2023) by showing that monetary controls over liquidity and interest rates lead banks to spend more on operations and earn less money in revenues. However, there is a need to pursue more diligent, disaggregated, and context-sensitive research that would allow identifying the actual effect of the monetary policy on the functioning of Nigerian banks.

Effect of Digital Banking Adoption and Operational Efficiency of Selected Deposit Money Banks (DMBs)

Research shows digital banking is improving in Nigeria slowly, but there are pertinent issues. Aduaka & Awolusi (2020) studied the impact of electronic banking on profitability in

the Nigerian banking industry from 2010 – 2017 using primary and secondary data drawn from the bank's staff, customers and the bank's audited financial statement. Drawing from descriptive and inferential statistics and multiple regression analysis, the analysis established the positive impact of electronic banking channels, particularly card products, on the profitability of banks and with ATMs as the second important channel. Additionally, the study shows that e-banking services contribute to patronage retention and loyalty by the customers and that this is influenced by service quality, security, reliability and efficiency for the utilisation of the e-banking services

Similarly, Awoniyi (2022) examined digital banking adoption trends in Nigeria, especially regarding Mobile and Internet banking tools within an extended Technology Acceptance Model (TAM). The model includes perceived usefulness alongside ease-of-use security measures and banking rules to boost digital banking adoption in Nigeria. However, more research is needed as those studies fail to properly examine platform features, collect small datasets, and neglect how these methods affect specific user groups. Research with complete data will help to better understand how Nigerians embrace digital banking to encompass the patterns of why or why not people adopt digital banking in Nigeria.

The Relationship between Green Financial Products on Perceived Customer Loyalty in Deposit Money Banks (DMBs)

Research indicates that Deposit Money Banks (DMBs) that have green financial products such as eco-loans and sustainable investments are effective in attracting customer loyalty. Nimitha & Goveas' (2024) study shows that customers prioritise environmental sustainability and tend to stay loyal to banks that practice green banking. Their research shows companies can run their operations better while holding onto customers by offering green loans, mobile banking and eco-friendly debit cards. They show how banks build trust with customers when they clearly explain their sustainability efforts as part of their communication strategy. Also, the study of Khushbu & Agarwal (2024) explored the relationship between green banking practices and customer loyalty using a mixed-method approach to gather data and proved that eco-loans and sustainable investment funds make customers view them more positively. Similarly, Njoku et al. (2022) researched how green innovations, especially solar panels and green conferences, affected Nigerian bank stakeholder satisfaction. The research proves customers believe banks that adopt green innovation demonstrate responsibility, which boosts both customer bond and team commitment. In spite of these insights, there are gaps. Not many studies examine the long-term effect of green products, the difference in adopting the product by customers, and the role of the digital platform in advocating green services. Effective communication and resistance to green banking research are also scanty, particularly in Nigeria.

Employee Engagement in Sustainable Initiative and the Relationship Between Sustainable Innovation and Business Growth of Deposit Money Banks (DMBs)

Studies indicate that employee engagement in Deposit Money Banks (DMBs) contributes to operational efficiency and business results. Sule et al. (2024) researched the impact of green staff involvement on business performance at Southeast Nigerian DMBs. Green employee participation creates better operational results that improve both innovation and company results. In the Temel et al. (2022) study, the research aimed to uncover the factors of employee participation (EP) and how they aid in fostering organisational

sustainability. A survey data dataset containing 305 full responses is used in the research, which is analysed by Friedman tests, Kruskal–Wallis tests, correlation analysis, and centrality measures. However, the study finds that all the EP factors are indispensable to the sustainability of organisations, though not all are of equal importance. On the whole, there is a need for more, multi-regional, and longitudinal studies to realise the actual influence of employee engagement on business development in the banking industry.

3. Methodology

Research Design

The study is a descriptive survey research designed to explore the effect of sustainable innovations on business growth in selected Deposit Money Banks (DMBs) in Mainland Lagos, Nigeria. This approach is effective for collecting data from a wide population, describing respondents' characteristics, and evaluating the relationships between key variables.

Population of the Study

The population of the study consists of the management and employees of selected Deposit Money Banks (DMBs) operating in Mainland Lagos State. In particular, Guaranty Trust Bank (GTB) in Ikeja consists of 18 management employees and 124 employees, which makes a total of 142 personnel. Access Bank in Surulere has 11 management employees, 105 employees, and a total staff of 116. The first bank in Agege has 10 management staff and 98 employees, which makes 108 workers. Zenith in Yaba has 14 management and 108 employees, making it 122 staff. In total, the research focuses on 53 management personnel and 435 employees, making a total population of 488 personnel in the four branches of DMB, which were selected. As obtained from each bank's Human Resources Department as of October 2024. This approach ensures that each bank is represented in a specific area, allowing for a comprehensive analysis of sustainable innovations and their effects on business growth.

Sample Size and Sampling Technique

For this study, the researcher used the Cochran formula (1977) to calculate the sample size. The formula is stated thus:

$$n = \frac{N(Z^2) X P X (1-P)}{E^2 X (N-1) + (Z^2) X P X (1-P)}$$

where:

n = the desired sample size

N = the total population size (488 staff in this case)

Z = the Z-score which is the confidence level at 95% or 1.96

P = the estimated proportion of the population. Assuming P is 0.5

E = the margin of error. Assuming 5% or 0.05

$$n = \frac{488(1.96^2) X\ 0.5 X (1-0.5)}{0.5^2 X (488-1) + (1.96^2) X\ 0.5 X (1-0.5)}$$

$$n = \frac{488 X\ 3.8416 X\ 0.25}{0.0025 X 487 + 3.8416 X\ 0.25}$$

$$n = \frac{488 X\ 0.9604}{1.2175 + 0.9604}$$

$$n = \frac{468.6752}{2.1779} = 215.19$$

Adjusted sample size is 216

A stratified sampling technique was employed to select the sample size for each bank in the strata.

Table 1: Sample Size Distribution Across the Selected Banks

S/N	Selected Banks	Management Staff	Employees	Management Staff and Employees	Sample Size Determination
1	Guaranty Trust Banks Agege	18	124	142	$\frac{142}{488} x\ 216 = 62.8$
2	Access Bank	11	105	116	$\frac{116}{488} x\ 216 = 51.3$
3	First Bank	10	98	108	$\frac{108}{488} x\ 216 = 47.8$
4	Zenith Bank	14	108	122	$\frac{122}{488} x\ 216 = 54$
	Total	53	435	488	216

Source: Researcher Survey, 2024

Research Instrument

The study employed a structured questionnaire as the primary data collection instrument, which was divided into two parts. The first section, Section A, is composed of questions targeting demographic and background aspects of the respondents. The core measures of the study (sustainable innovation and business growth) were through in section B. The questionnaire was adapted from previously validated instruments found in the literature and appeared on a five-point Likert scale, from Strongly Disagree to Strongly Agree. The items in this section were used to operationalise independent, dependent and moderating variables. All rated on a five-point Likert scale.

Pilot Study

Before the distribution of the questionnaire, a pilot study was carried out. For this, twenty (20) questionnaires were distributed to twenty (20) people from this population who were not included in the final sample. This initial study has the objective to evaluate how many of the questions understood by participants understood, how participants engaged with the survey and how they responded to the mechanism for answering.

Validity and Reliability of the Research Instrument

The researcher's supervisor examined the questionnaire to ensure it included all relevant variables, thus confirming its content validity. To assess the instrument's reliability, Cronbach's alpha was used to evaluate its internal consistency. This test helps to determine the level of consistency across various items, ensuring that all parts of the questionnaire measure the same underlying construct.

Method of Data Analysis

The study employed Structural Equation Modelling (SEM) to explore relationships among variables such as regulatory challenges, economic volatility, digital banking adoption, green financial products, employee engagement, and business growth. After data cleaning and descriptive analysis, Confirmatory Factor Analysis (CFA) validated the measurement model. Model fit was assessed using Chi-square, CFI, and RMSEA indices. Path coefficients

revealed direct and indirect effects among constructs, while moderation was tested using interaction terms.

4. Results and Discussion

Partial Least Squares Structural Equation Modelling Results

The constructs used in the study include REV (Regulatory Challenge and Economic Volatility), DBA (Digital Banking Adoption), GFP (Green Financial Products), EE (Employee Engagement), PLP (Perceived Long-Term Profitability), OPE (Operational Efficiency), and PCL (Perceived Customer Loyalty). To improve the measurement model's reliability and validity, items with low factor loadings (below 0.60), specifically DBA4, DBA5, EE4–EE8, GFP1, GFP3–GFP6, and OPE1, were removed from the analysis.

Internal Consistency, Reliability, and Convergent Validity (AVE) Results

Cronbach's Alpha, rho_A, Composite Reliability (CR), and Average Variance Extracted (AVE) were used to determine the reliability and validity of the constructs. All the values of Cronbach's Alpha were above the 0.70 threshold and varied between 0.713 and 0.937, showing strong internal consistency. The Operational Efficiency and Perceived Customer Loyalty obtained the highest reliability. The majority of rho_A values surpassed the 0.70 threshold, although Regulatory Challenge and Economic Volatility (0.676) measured just below the norm, yet close to an acceptable margin. Excellent construct reliability was supported by the value of Composite Reliability (0.833-0.955). The convergent validity of all AVE scores was above 0.50. The Operational Efficiency and many more, including the Perceived Long-Term Profitability and Employee Engagement, exceeded the standard, with a high AVE (0.841). Overall, the constructs portrayed high scores in reliability and validity, which shows that the measurement model was appropriate in studying sustainable innovation in the sample. (See Table 4.).

Table 2: Internal Consistency Reliability and Convergent Validity (AVE)

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
DBA	0.713	0.749	0.833	0.626
EE	0.888	0.917	0.892	0.546
GFP	0.784	0.875	0.843	0.575
OPE	0.937	0.938	0.955	0.841
PCL	0.913	0.914	0.935	0.743
PLP	0.809	0.788	0.855	0.545
REV	0.836	0.676	0.854	0.597

Source: Researcher Computation (SMARTPLS), 2025

Discriminant Validity

The discriminant validity was measured by Heterotrait-Monotrait Ratio (HTMT) with less than 0.85 representing a satisfactory level. All the HTMT values in the study were below the threshold, which proves that there was a considerable difference between the constructs. An example of this is the HTMT between Digital Banking Adoption and Employee Engagement (0.767) and Green Financial Products and Perceived Long-Term Profitability (0.675), and all of these show enough discriminant validity. The most significant was 0.843

between Employee Engagement and Regulatory Challenges, which was near the limit but still within the acceptable range. On the other hand, few constructs, such as Digital Banking Adoption and Regulatory Challenges (0.039), exhibited low correlation, indicating their uniqueness. In general, the findings confirm that the constructs are empirically different, which proves the validity of the model. (See Table 3)

Table 3: Heterotrait-Monotrait Ratio (HTMT) (< 0.85)

	DBA	EE	GFP	OPE	PCL	PLP	REV
DBA							
EE	0.767						
GFP	0.711	0.821					
OPE	0.053	0.092	0.105				
PCL	0.081	0.098	0.092	0.838			
PLP	0.764	0.820	0.675	0.115	0.121		
REV	0.039	0.843	0.780	0.113	0.110	0.696	

Source: Researcher Computation (SMARTPLS), 2025

Testing of Hypothesis and Discussion of Findings

Hypothesis One ($H0_1$): Regulatory challenges and economic volatility are not the major hindrances to sustainable innovations in the selected Deposit Money Banks (DMBs), and these barriers do not affect the perceived long-term profitability of these banks.

Regulatory challenges and economic volatility had a statistically significant positive effect on the perceived long-term profitability ($\beta = 0.606$; $t = 8.647$; $p = 0.001$). This means that the regulatory and economic barriers affect profitability towards the adoption of sustainable innovation to a considerable extent. Hence, $H0_1$ (null hypothesis) is rejected.

Hypothesis Two ($H0_2$): Digital banking adoption has no significant effect on the operational efficiency of the selected Deposit Money Banks (DMBs) in Mainland Lagos

Digital banking adoption to operational efficiency was also found as significant and positive ($p = 0.001$), and the path coefficient ($t = 0.444$) was much higher. This shows that the operational efficiency of banks under study is greatly enhanced by digital banking adoption; therefore, the null hypothesis ($H0_2$) can be rejected.

Hypothesis Three ($H0_3$): There is no significant relationship between green financial products such as green loans, eco-friendly investments and perceived customer loyalty in the selected Deposit Money Banks (DMBs) in Mainland Lagos

The result showed a significant and positive correlation between green financial products and perceived customer loyalty (β 0.544; $t = 9.541$; $p = 0.001$). This implies that customer loyalty in the banking industry is highly affected by green financial efforts. Thus, the null hypothesis is rejected, $H0_3$.

Hypothesis Four ($H0_4$): Employee engagement in sustainable initiatives does not significantly moderate the relationship between sustainable innovation and the business growth of the selected Deposit Money Banks (DMBs) in Mainland Lagos

Moderation analysis reveals that Employee engagement played a significant role in the relationship between sustainable innovation and two important measures of business growth; viz, perceived long-term profitability ($\beta = 0.146$; $t = 2.283$; $p = 0.022$) and perceived customer loyalty ($\beta = -0.205$; $t = 5.407$; $p = .001$). Nevertheless, the moderation effect on operational

efficiency was not significant (β = 0.088; t = 1.127; p = 0.260). $H0_4$ is therefore partially rejected.

Model Predictive Power (R^2 Value)

The structural model was quite strong and moderate in predictive power. The model explained Perceived Long-Term Profitability (R^2 = 0.419), Operational Efficiency (R^2 = 0.640) moderately, and Perceived Customer Loyalty with a high R^2 of 0.811. This shows that sustainable innovation activities have a great impact on the profitability, efficiency and customer loyalty in the banking sector of Nigeria.

Table 6: R Square Value

Constructs	R^2 Value
PLP	0.419
OPE	0.640
PCL	0.811

Source: Researcher Computation (SMARTPLS), 2025

Table 7: Path Coefficient Estimates

Constructs	Coefficient	Standard Deviation	T-Statistics	P-Values
REV -> PLP	0.606	0.070	8.647	0.001
DBA -> OPE	0.444	0.092	4.830	0.001
GFP -> PCL	0.544	0.057	9.541	0.001
Moderating Effect (EE -> PLP)	0.146	0.064	2.283	0.022
Moderating Effect (EE-> OPE)	0.088	0.078	1.127	0.260
Moderating Effect (EE-> PCL)	-0.205	0.038	5.407	0.001

Source: Researcher Computation (SMARTPLS), 2025

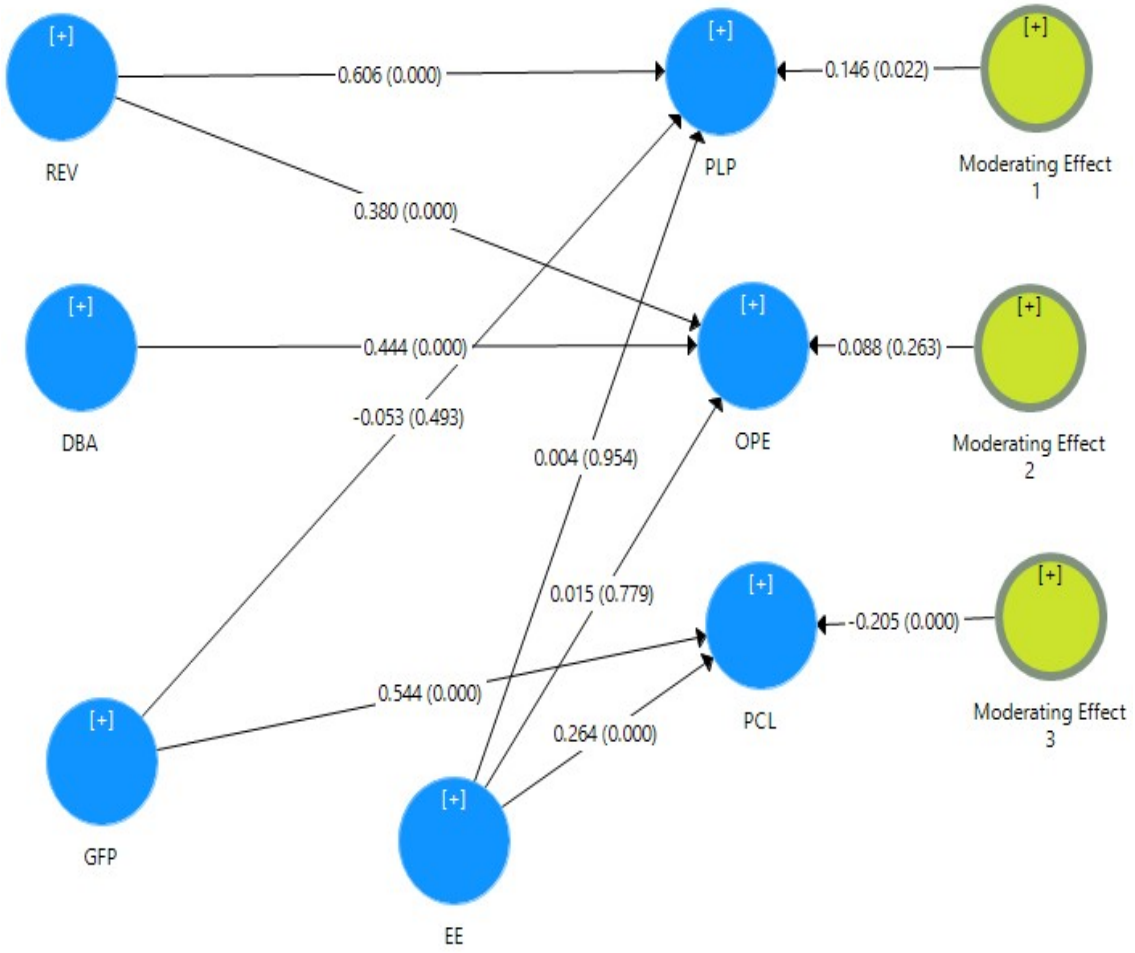

Figure 2: Bootstrapped Structural Model.

Discussion of Findings

The structural model showed that there was a strong positive correlation between the main sustainable innovation variables and business outcomes within the Nigerian banking sector. Economic volatility and regulatory challenges had a significant effect on long-term showing how 41.9% of the variance in the long-term profitability can be attributed to it (R^2 = 0.419). This confirms the argument that banks take their profitability perspectives under the influence of external pressure, similar to what Institutional Theory or other authors, such as findings by Osakwe et al. (2022) and Oladejo et al. (2023), have mentioned about how regulations impose pressure but also shape behaviour.

The adoption of digital banking influenced operational efficiency positively, and the R^2 indicating the level of explanatory power was 0.640, implying that digital banking adoption provided a strong explanatory power. This is congruous with the previous research findings (Aduaka & Awolusi, 2020; Awoniyi, 2022) that demonstrated that digital tools improve the quality of work by lowering the incidence of mistakes, expenditure, and latency. Institutional Theory and Stakeholder Theory buttress this result with their focus on the

importance of digital platforms in satisfying the expectations of the customer, workers, and controls.

High customer loyalty was also significantly influenced positively by green financial products, where the predictive power (R^2) was high (0.811). This confirms the results of Nimitha & Goveas (2024), Khushbu & Agarwal (2024), and Njoku et al. (2022), who identify the connection between green services and improved customer trust and customer loyalty. The conclusion is coherent with the Stakeholder Theory, which demonstrates how satisfaction of the environmental requirements enhances the connections between the stakeholders, and Institutional Theory, according to which banks react to regulation and social requirements of sustainability.

Moderation analysis revealed that employee engagement played a significant role in improving the association between sustainable innovation and profitability, had a limited impact on operational efficiency (beta = 0.088; p = 0.260) and adversely influenced customer loyalty. Such mixed results indicate that employee engagement enhances profitability but could not necessarily adhere to customer experiences; thus, there must be certain implementation gaps within the organisation. This is consistent with the literature (Sule et al., 2024; Temel et al., 2022) and corroborates the significance of the real employee involvement in advancing sustainable innovation through the prism of the Institutional and Stakeholder Theories.

5. Conclusion and Recommendations

The research presented examined the role of sustainable innovation in business growth among a sample of Deposit Money Banks (DMBs) within Mainland Lagos, Nigeria based on two theories, Institutional and Stakeholder theories. It concluded that regulatory and economic pressures may promote profitability in the case of innovative responses among banks, whereas digital banking stimulates operational efficiency and green financial products promotes consumer loyalty. Mixed results were noted with regard to employee engagement which promoted profitability and not efficiency and influenced loyalty negatively. These results are supportive of the idea that innovation, technology, and stakeholder needs must be embraced by DMBs that aspire to flourish in the long term in a dynamic environment.

Recommendations

Based on the findings and conclusions made in this research study, the following are the recommendations to be made:

i. Digital platforms should be upgraded and cybersecurity improved, and customers should be informed about their advantages to boost efficiency and adoption levels
ii. Engage employees in the sustainability aspects by training them and defining what they are to do in order to increase the outcomes of innovation and business performance.
iii. Policymakers should reduce some of the stringent and overly restrictive policies that affect banks' innovation so that the banks would be in a position to expand, keeping them compliant and financially stable.
iv. Establish regular performance reviews of sustainable innovation efforts to ensure alignment with business goals and adapt strategies as needed.

Contributions to Knowledge

The study contributes to the body of knowledge on sustainability because it provides empirical knowledge that is scarce on the Nigerian banking sector and applies a combination

of Institutional and Stakeholder theories to capture the main factors of sustainable innovation. It presents the previously unexplored relationships, such as the moderating role of employee engagement and the impact of green products on customer loyalty, and generates a good predictive model that can be applied in further studies of service-oriented sectors.

Limitations and Suggestions for Further Research Studies

This study is associated with certain limitations. It was limited to Lagos Mainland Deposit Money Banks, and therefore could not be generalised to other regions or other financial institutions such as microfinance and non-bank institutions. It is cross-sectional in design as well; it limits the understanding of the long-term sustainability implications. The study had a narrow spectrum because the constructs excluded such measures as corporate governance, leadership style, digital literacy, and consumer education, which may also affect the results of sustainability. Also, due to its sector-based findings, the model may be further improved by its application to other economic sectors like manufacturing or healthcare. Finally, some of the items of measurement (e.g., EE1, PLP5, REV1, REV5, REV6) revealed low factor loadings, which might have an impact on the construct accuracy; these items can be refined or removed in future studies to enhance the model reliability.

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