

Beyond compliance: How ESG dashboards enable strategic sustainability management in Nigerian organizations

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Abstract. This study investigates the impact of ESG (Environmental, Social, and Governance) dashboards on sustainability management practices in Nigerian organizations, focusing on three key capabilities: Data Integration, Real-Time Monitoring and Responsiveness, and Predictive Analytics. The specific population consisted of 480 relevant personnel from organizations such as Dangote Cement, Access Bank, Nigerian Breweries, MTN Nigeria, and Oando PLC. A scientifically determined sample size of 218 respondents was drawn using Yamane's (1967) formula, with proportional allocation across the five organizations. A total of 200 valid questionnaires were retrieved, achieving a response rate of 91.7%. Data were collected through a structured questionnaire designed to quantitatively assess the effectiveness of ESG dashboard capabilities in driving sustainability efforts beyond compliance. Regression analysis was employed to assess the relationship between the ESG dashboard capabilities and sustainability outcomes, with the results indicating that Real-Time Monitoring and Responsiveness had the most significant effect, followed by Data Integration and Predictive Analytics. Sector-specific findings suggest that industries such as telecommunications and financial services may benefit more from enhanced real-time monitoring, whereas sectors like cement manufacturing and oil & gas may focus more on predictive analytics and data integration. Finally, the study recommends future research to explore ESG dashboard adoption in other developing economies and investigate the long-term effects of these technologies on organizational sustainability.

Keywords. Data integration, real-time monitoring and responsiveness, predictive analytics, sustainability management, beyond compliance.

1. Introduction

1.1 Background to the study

In the era of sustainability-driven corporate governance, organizations worldwide are transitioning from a reactive, compliance-based approach to one that is more proactive and strategic. The concept of Environmental, Social, and Governance (ESG) management is central to this transition. In Nigeria, businesses are gradually recognizing that merely adhering to ESG regulations is insufficient for long-term success. Instead, they are leveraging tools such as ESG dashboards, which provide real-time insights and facilitate data-driven decision-making. These dashboards, equipped with advanced capabilities such as Data Integration, Real-Time Monitoring and Responsiveness, and Analytical and Predictive Capabilities, allow organizations to go beyond compliance and strategically enhance their sustainability practices.

ESG dashboards consolidate data from multiple sources, which may include internal records, external sustainability benchmarks, and third-party ESG ratings. This capability is crucial for creating a comprehensive, holistic view of sustainability efforts. It ensures that an organization is not merely collecting data for regulatory reporting, but is instead integrating various aspects of ESG performance such as environmental impact, social responsibility, and governance practices. By connecting disparate data points across operations, ESG dashboards allow organizations to identify correlations and potential gaps, driving continuous improvement and enabling long-term strategic planning [1]. Beyond compliance, this integration empowers organizations to enhance their overall sustainability management by aligning their efforts with global best practices, rather than focusing solely on meeting regulatory requirements.

The ability to track sustainability metrics in real-time ensures that organizations can respond promptly to emerging challenges or opportunities. This feature of ESG dashboards provides actionable insights into the current performance of various sustainability indicators, allowing organizations to make immediate adjustments. Beyond compliance, real-time monitoring enables businesses to anticipate and mitigate risks proactively, from environmental issues like waste management to governance concerns such as labor rights violations. Organizations can also use these insights to seize new opportunities in sustainable product development or socially responsible investments, thereby creating a competitive edge [2]. The agility enabled by real-time responsiveness allows businesses to adopt a dynamic approach to sustainability, rather than relying on outdated or static reports.

ESG dashboards equipped with advanced analytics and predictive modeling techniques go a step further by enabling organizations to forecast future trends and assess potential risks in their sustainability strategies. These capabilities help organizations not only anticipate future compliance requirements but also identify sustainability-driven opportunities that are not immediately apparent. By using predictive analytics, companies can optimize their sustainability investments, foresee the financial and reputational impacts of environmental risks, and better align their sustainability goals with

evolving market demands [3]. Beyond compliance, this forward-looking approach to sustainability allows organizations to innovate and set ambitious, long-term goals that align with global sustainability movements, such as the UN Sustainable Development Goals (SDGs).

Globally, leading corporations such as Unilever and Nestlé have demonstrated how leveraging the capabilities of ESG dashboards can drive performance that goes beyond legal obligations. For instance, Unilever uses advanced analytics to drive their sustainability innovations, focusing on reducing carbon emissions and promoting ethical sourcing across their supply chains [4]. Similarly, Microsoft and Tesla employ real-time monitoring and predictive analytics to stay ahead of environmental regulations, but also to shape their future sustainability agenda in a way that supports innovation and market leadership [5]. These examples highlight how organizations globally are using ESG dashboards not only for compliance but as a core component of strategic sustainability management, offering significant competitive advantages. In Nigeria, prominent organizations have integrated ESG dashboards as part of their sustainability strategies. Notable examples include Dangote Cement, Access Bank, Nigerian Breweries, MTN Nigeria, and Oando PLC. Each of these companies has tailored its ESG strategies to address sector-specific sustainability challenges and opportunities. For instance, Dangote Cement has focused on reducing its carbon footprint by adopting alternative fuels and enhancing energy efficiency, while Access Bank has pioneered sustainable banking practices, incorporating environmental and social risk management into its operations. Nigerian Breweries has taken significant steps in water conservation and waste reduction, and MTN Nigeria has implemented energy-efficient network infrastructure alongside various social programs in education and healthcare. Similarly, Oando PLC has invested in renewable energy and strengthened its environmental management systems in oil and gas operations.

These efforts align with Nigeria's evolving regulatory framework, which supports ESG initiatives through the Nigerian Stock Exchange (NSE) Sustainability Disclosure Guidelines and the Climate Change Act of 2021, encouraging transparent ESG reporting and sustainable business practices. In as much as many Nigerian companies are increasing their ESG focus, many still have limited understanding of how these dashboards can be used to drive sustainable growth rather than merely satisfy regulatory obligations. This research aims to explore how Nigerian businesses can enhance their sustainability practices by fully leveraging the capabilities of ESG dashboards.

1.2 Statement of the problem

Despite the growing adoption of ESG dashboards in Nigerian organizations, their use is often limited to fulfilling regulatory requirements, with little focus on utilizing their full capabilities for long-term sustainability management. Many Nigerian companies are still largely compliance-driven, only tracking ESG metrics to meet local and international standards rather than to drive strategic decision-making. While ESG dashboards are equipped with advanced features such as Data Integration, Real-Time Monitoring, and Predictive Analytics, these capabilities are often underutilized, limiting their effectiveness in promoting comprehensive sustainability practices. As such, Nigerian organizations are missing opportunities to enhance their sustainability performance in ways that go beyond meeting minimum compliance standards.

This study seeks to explore how Nigerian businesses can leverage these advanced ESG dashboard capabilities not only to comply with regulations but also to improve their sustainability management strategies. It will specifically focus on how Data Integration, Real-Time Monitoring and Responsiveness, and Analytical and Predictive Capabilities can enable organizations to transition from a compliance-focused approach to a more dynamic, forward-thinking sustainability management system.

1.3 Specific objectives

- i. To examine the impact of Data Integration Capability in ESG dashboards on the ability of Nigerian organizations to manage sustainability beyond compliance.
- ii. To investigate how Real-Time Monitoring and Responsiveness in ESG dashboards support Nigerian organizations in adapting to sustainability challenges in real-time, beyond compliance.
- iii. To analyze how Analytical and Predictive Capabilities of ESG dashboards empower Nigerian organizations to forecast sustainability trends and risks, going beyond compliance.

1.4 Research hypotheses

- H0₁:** Data Integration Capability of ESG dashboards do not positively impact the ability of Nigerian organizations to manage sustainability in a way that goes beyond compliance requirements.
- H0₂:** Real-Time Monitoring and Responsiveness through ESG dashboards does not positively affect the ability of Nigerian organizations to adapt to sustainability challenges and opportunities beyond compliance.
- H0₃:** Analytical and Predictive Capabilities of ESG dashboards do not contribute to the formulation of long-term sustainability strategies by enabling Nigerian organizations to forecast and act on sustainability trends beyond compliance.

2. Literature review

2.1 Conceptual review

2.1.1 Sustainability beyond compliance

According to [6], sustainability management involves integrating environmental, social, and economic practices into business operations to ensure long-term organizational success and resilience. It goes beyond compliance to create value for both stakeholders and society by addressing complex, evolving challenges like climate change, resource scarcity, and social inequality. Reference [1] stated that sustainability beyond compliance is a strategy where organizations proactively adopt practices that enhance their environmental and social impact, even when they are not legally mandated to do so. This approach views sustainability as integral to competitive advantage and brand reputation, rather than a regulatory compliance. Reference [7] describe corporate sustainability as the strategic implementation of practices that balance economic, social, and environmental concerns, with the goal of achieving positive long-term outcomes. This approach is often driven by a commitment to ethical practices, stakeholder expectations, and the desire to mitigate future risks.

Sustainability management beyond compliance is a proactive approach that prioritizes environmental stewardship, social responsibility, and economic growth within organizational operations [5]. Rather than simply following regulatory requirements, organizations aim to exceed standards by embedding sustainable practices into their core strategy. For instance, a company might adopt renewable energy solutions, engage in community development, or ensure fair labor practices, not because they must but because it aligns with their long-term goals and values [6]. In practice, organizations implement sustainability management beyond compliance through initiatives like reducing greenhouse gas emissions, conserving resources, and enhancing diversity and inclusion. This may also include partnerships with community organizations, supply chain sustainability improvements, and transparent reporting on environmental and social impact [5]. Companies such as Unilever and Patagonia are examples of businesses that incorporate these practices into their daily operations, often going beyond regulatory demands to foster a positive impact on the planet and society [1].

Sustainability management is commonly measured through ESG (Environmental, Social, and Governance) indicators, which assess an organization's environmental impact, social responsibility, and governance quality. Key metrics include carbon footprint, energy consumption, waste generation, employee diversity, community impact, and governance practices. These indicators offer quantifiable insights into the effectiveness of an organization's sustainability strategies and their alignment with broader social and environmental goals [6]. For the purposes of this study, sustainability management beyond compliance is defined as the proactive integration of environmental, social, and governance practices that exceed regulatory requirements, with the aim of fostering long-term value, resilience, and ethical impact for both stakeholders and society. This approach reflects a commitment to sustainable development and is seen as a strategic asset that can lead to competitive advantage, brand differentiation, and improved organizational resilience.

2.1.2 ESG dashboards

ESG Dashboards are digital tools that enable organizations to monitor, analyze, and report on their Environmental, Social, and Governance (ESG) performance in real-time. These dashboards integrate data from various sources, providing a comprehensive and visually engaging summary of an organization's sustainability metrics. ESG dashboards support organizations in tracking their progress on sustainability goals beyond mere compliance, helping to embed sustainability into their core business strategies [8, 9]. An ESG Dashboard is a centralized platform that collects, organizes, and visualizes data regarding a company's environmental, social, and governance activities. These dashboards typically feature key performance indicators (KPIs) across all three dimensions of ESG--environmental impact (e.g., carbon footprint), social responsibility (e.g., workforce diversity), and governance practices (e.g., board diversity and transparency). ESG dashboards serve as a decision-making tool that supports real-time insights, predictive analysis, and benchmarking [10, 11].

ESG dashboards collect data from various internal departments and external sources such as regulatory bodies, sustainability reports, and environmental monitoring tools. The data collected is often unstructured and from a wide array of channels [3, 12]. The collected data is then integrated into a unified platform where it is standardized, processed, and made ready for analysis. This integration helps create a holistic view of the company's ESG performance [11, 13]. ESG dashboards feature real-time monitoring capabilities, enabling the tracking of sustainability metrics as they evolve. This allows companies to respond promptly to any emerging risks or opportunities [9]. Many ESG dashboards also include predictive analytics, using historical data to forecast trends and potential future risks. This allows for proactive decision-making in sustainability strategies [10, 14]. The final outputs of ESG dashboards are usually comprehensive reports that visually represent data. These reports can be used for internal monitoring or shared with external stakeholders, such as investors, regulators, and customers [3, 15].

A primary challenge for ESG dashboards is obtaining high-quality, consistent, and reliable data. Inaccurate or incomplete data can undermine the dashboard's effectiveness, leading to poor decision-making [10, 16]. Integrating ESG data from disparate sources and departments can be complex, especially when different systems use various data formats. This can lead to delays or inefficiencies in the integration process [3, 17]. The lack of standardized ESG metrics and reporting practices complicates the ability to benchmark performance across companies or industries [1, 16]. Some organizations, especially those in developing markets, may lack the necessary technological infrastructure to support the implementation and ongoing use of ESG dashboards [10, 18]. The evolving nature of ESG regulations means that

companies must frequently adjust their dashboards to ensure compliance. This can be resource-intensive and difficult to manage in the long-term [3].

ESG dashboards enable organizations to make data-driven decisions that go beyond mere compliance. By offering insights into operational sustainability, dashboards help align sustainability efforts with business strategy [2, 10]. The visualization of ESG data helps companies demonstrate their commitment to sustainability to both internal and external stakeholders, thus enhancing corporate transparency [3, 15]. ESG dashboards provide standardized and comprehensive reports, which can be used to communicate progress to stakeholders, such as investors and regulators, in a clear and transparent manner [9, 12]. With the real-time monitoring and predictive analytics offered by ESG dashboards, companies can identify potential risks and opportunities before they become critical, facilitating proactive sustainability management [14, 19].

With the increasing demand for standardized ESG reporting, ESG dashboards will continue to evolve to comply with global frameworks like GRI and TCFD. This will help businesses meet investor and regulatory expectations [12]. The integration of artificial intelligence (AI) and machine learning (ML) in ESG dashboards is set to improve predictive capabilities and provide deeper insights into sustainability performance [3, 12]. As more companies embrace ESG practices, the demand for user-friendly and cost-effective ESG dashboards will increase, particularly in emerging markets like Nigeria. This will facilitate the broader adoption of sustainability technologies [13]. ESG dashboards will become increasingly essential as regulatory requirements evolve. Companies will rely on these tools for real-time monitoring and to stay ahead of emerging ESG regulations [20, 21].

For the purposes of this study, ESG dashboards are defined as advanced digital tools that enable organizations to manage and track their Environmental, Social, and Governance (ESG) data in real-time. These dashboards go beyond simple compliance reporting, integrating diverse data sets, providing predictive analytics, and offering dynamic insights into sustainability performance. Through these capabilities, ESG dashboards empower companies to manage sustainability proactively and strategically, aligning their efforts with long-term corporate goals rather than just meeting regulatory demands. ESG dashboards are abound with several capabilities but this study is focused on Data Integration, Real-Time Monitoring and Responsiveness, and Analytical and Predictive Capabilities as discussed hereunder.

i. Data Integration Capability

The data integration capability of ESG dashboards allow organizations to consolidate and synthesize information from various sources, providing a comprehensive overview of their sustainability practices. By aggregating diverse data--ranging from environmental metrics to social performance indicators--this capability enables organizations to develop a strategic approach to sustainability that is aligned with global best practices. For Nigerian organizations, this means integrating internal data with external sources such as regulatory updates, industry benchmarks, and stakeholder input, which leads to more informed decision-making. The ability to unify different datasets offers a holistic view of an organization's sustainability performance, helping it not only to comply with regulations but to proactively shape its sustainability agenda beyond compliance [13, 20, 22]. However, challenges such as data fragmentation and the complexity of aligning diverse data types from different platforms may hinder the effectiveness of this integration. Standardizing data formats and overcoming technical limitations are necessary to fully leverage this capability [3].

ii. Real-Time Monitoring and Responsiveness

Real-time monitoring and responsiveness in ESG dashboards play a crucial role in helping organizations adapt to sustainability challenges as they occur. By continuously tracking key sustainability metrics, ESG dashboards enable businesses to respond dynamically to environmental and social changes [1]. In Nigeria, this capability is especially relevant given the fast-paced and evolving sustainability landscape, which includes issues such as climate change, regulatory shifts, and social pressure from stakeholders. With real-time monitoring, Nigerian organizations can quickly identify emerging risks or opportunities, which allows for rapid adjustments in operations or strategies to maintain or improve sustainability performance. This capacity to respond immediately, based on up-to-the-minute data, fosters continuous improvement and supports the organization in going beyond mere compliance to become a sustainability leader [17, 23, 24]. Nonetheless, implementing real-time monitoring presents challenges such as the technical complexity of gathering and processing large volumes of data, as well as the organizational resistance to adopting new technologies, particularly in businesses that are not yet deeply embedded in sustainability practices [12, 20].

iii. Analytical and Predictive Capabilities

The analytical and predictive capabilities of ESG dashboards further enhance sustainability management by allowing organizations to forecast future sustainability trends and risks. These capabilities rely on advanced data analytics, including artificial intelligence (AI) and machine learning (ML), to process historical data and predict future sustainability outcomes. For Nigerian organizations, these predictive tools are particularly valuable in anticipating long-term risks such as resource scarcity, climate impacts, and changing societal expectations, which can significantly affect operations and reputation. By providing insights into future trends, ESG dashboards empower organizations to take proactive measures to address these risks and seize emerging opportunities, allowing them to move beyond compliance. Predictive analytics supports strategic decision-making by identifying areas where intervention is necessary before a potential problem becomes critical, thus ensuring the organization is not just reactive but prepared for future challenges [1, 10, 14]. However,

the application of predictive analytics comes with challenges, particularly related to the complexity of the models and the need for accurate data to ensure reliable forecasts. Without proper data quality and model accuracy, organizations may risk making misguided decisions that could undermine their sustainability efforts [12].

Together, these three capabilities--data integration, real-time monitoring, and predictive analytics--help Nigerian organizations to not only comply with sustainability regulations but to strategically manage their sustainability efforts in a proactive and comprehensive manner. By integrating and analyzing sustainability data, monitoring progress in real time, and forecasting future trends, organizations can make more informed decisions that support long-term sustainability goals. While these capabilities offer significant benefits, the successful implementation of ESG dashboards requires overcoming various challenges, including technical limitations, data integration complexities, and organizational resistance to change. Nonetheless, when effectively utilized, ESG dashboards can transform sustainability management, making it more agile, data-driven, and aligned with global best practices [22, 24]

2.1.3 ESG dashboards and sustainability management

Data integration capability is highly beneficial for sustainability management, as it consolidates diverse ESG data into a single platform, thereby enhancing decision-making. This comprehensive view enables leaders to make informed, strategic choices that align with long-term sustainability objectives. With integrated data, organizations can identify patterns and interdependencies across various sustainability metrics, such as environmental impact and social responsibility, allowing them to address these areas in a coordinated manner [13, 20]). The holistic insight provided by data integration thus fosters a proactive approach to sustainability, helping organizations prioritize impactful initiatives over mere compliance. Another advantage of data integration capability is the improvement in transparency and accountability it brings. When ESG data is consolidated, it becomes easier to present clear, consistent reports to stakeholders, strengthening trust and enhancing the organization's reputation. Transparent reporting practices also demonstrate accountability, as stakeholders can track an organization's sustainability progress over time [6, 25]. This credibility is particularly crucial in the current environment, where consumers, investors, and regulatory bodies are increasingly vigilant about companies' sustainability commitments.

Additionally, data integration capability leads to significant efficiency gains in reporting and compliance. By centralizing ESG data, organizations can streamline the often-complex process of regulatory reporting, ensuring that they meet required standards with fewer resources and less time. This efficiency allows them to focus on innovative, voluntary sustainability practices rather than merely fulfilling mandatory requirements, positioning the organization as a leader in sustainable business practices [7]. However, one challenge associated with data integration capability is the potential for data accuracy and quality issues. With data coming from various sources, inconsistencies can arise, making it difficult to ensure the accuracy of the information being reported. If not carefully managed, poor data quality can undermine sustainability efforts, leading to misguided strategies and potential reputational risks [15]. Inaccurate data integration may lead organizations to invest in ineffective initiatives, thus detracting from the overall sustainability objectives.

Real-time monitoring and responsiveness in ESG dashboards enable organizations to adapt to sustainability challenges as they arise, facilitating a more dynamic approach to sustainability management. Real-time data allows companies to respond quickly to issues like environmental hazards, resource shortages, or social challenges. This responsiveness encourages continuous improvement, as it allows for adjustments to strategies in a way that surpasses static compliance requirements and keeps pace with evolving sustainability needs [4]. By tracking sustainability metrics in real-time, organizations can identify risks and take preventive actions, furthering their goals beyond basic regulatory obligations. A major benefit of real-time monitoring is its support for long-term resilience. Organizations that can detect and respond promptly to potential sustainability threats are better positioned to avoid costly crises and manage resources efficiently. This capability is particularly valuable in industries that are heavily regulated or prone to supply chain disruptions, as it helps mitigate risks that could compromise compliance or operational continuity [12]. Real-time monitoring thus enables a sustainable approach that is both resilient and forward-thinking, contributing to stronger risk management and improved operational stability.

Furthermore, real-time responsiveness strengthens engagement with stakeholders, who expect companies to be agile in addressing sustainability issues. The ability to report real-time progress on sustainability goals reassures stakeholders that the organization is committed to transparency and continuous improvement, which can enhance its reputation and build stronger community and investor relations [15]. This heightened stakeholder confidence is a strategic asset, as it can translate into greater loyalty and investment in the organization's sustainability journey. Despite these advantages, real-time monitoring can also be resource-intensive, requiring significant investment in technology and staff to manage and interpret data continuously. Smaller organizations, or those with limited resources, may struggle to maintain real-time systems, potentially creating disparities in sustainability management capabilities across different sectors [15]. This technological demand may also detract from other sustainability efforts if resources are over-allocated to monitoring infrastructure at the expense of action-oriented initiatives.

Analytical and predictive capabilities of ESG dashboards empower organizations by allowing them to anticipate future sustainability trends and risks, enabling proactive rather than reactive management. Through predictive analytics, companies can model potential outcomes based on historical data, identifying long-term sustainability opportunities that support strategic growth. This forward-looking capability allows organizations to address sustainability in a meaningful way that extends beyond compliance, as it encourages a commitment to long-term environmental and social goals [7]. Predictive capabilities thus help shape organizational strategies that align with both regulatory expectations and broader

sustainability trends. In addition to strategic foresight, predictive analytics enhances resource efficiency by helping organizations allocate resources more effectively. By forecasting sustainability risks and opportunities, companies can make informed decisions about where to invest in environmental, social, and governance initiatives. This efficient allocation not only reduces costs but also enables organizations to maximize the impact of their sustainability practices, yielding greater returns on their sustainability investments [6]. Predictive capabilities thus contribute to a more resource-conscious and impactful approach to sustainability management.

Moreover, predictive capabilities in ESG dashboards can improve competitive positioning by allowing organizations to stay ahead of emerging sustainability demands. Companies that leverage these tools are better equipped to anticipate and respond to shifts in consumer preferences, regulatory requirements, and market dynamics, which can confer a competitive advantage. As consumers and investors increasingly prioritize sustainable practices, predictive analytics enable organizations to position themselves as leaders in sustainability, helping them to capture market share and strengthen brand loyalty [1, 26]. However, one downside of predictive capabilities is the potential risk of over-reliance on forecasting, which can lead to complacency. Predictive models are only as accurate as the data and assumptions they are based on; if these inputs are flawed, the resulting predictions may mislead organizations, causing them to invest in ineffective or unsustainable practices [27]. This over-dependence on analytics could result in strategic missteps, especially if the organization relies on predictions at the expense of real-time data or fails to adapt to unexpected sustainability challenges.

2.2 Theoretical framework

2.2.1 The Resource-Based View (RBV) theory

The Resource-Based View (RBV) theory Proposed by [28] is a strong theoretical foundation for this study on ESG dashboards and sustainability management, particularly because it emphasizes the role of an organization's resources and capabilities in achieving sustainable competitive advantage. RBV posits that unique, valuable, and difficult-to-imitate resources are critical for long-term success. ESG dashboards align with RBV as they provide organizations with distinct resources such as data integration, real-time monitoring, and predictive analytics that can lead to sustainable performance beyond basic compliance [17, 18]. These capabilities support strategic sustainability efforts that are integral to differentiation in a competitive landscape.

Under RBV, the unique capabilities offered by ESG dashboards (data integration, real-time monitoring, and predictive analytics) allow firms to respond effectively to environmental and social demands. This goes beyond simple regulatory compliance, pushing organizations toward proactive, strategic sustainability management that aligns with the RBV focus on leveraging unique resources for a competitive edge [7, 10].

Additionally, RBV supports the concept that leveraging these ESG capabilities can foster continuous improvement and resilience, empowering organizations to anticipate and address future sustainability challenges and seize new opportunities [8, 25]. Therefore, RBV not only validates the role of ESG dashboards in sustainability management but also underscores their importance in advancing sustainability goals beyond compliance, strengthening the strategic positioning of Nigerian organizations in a globally competitive market.

3. Methodology

3.1 Research design/population of the study

This study adopted a descriptive survey research design. The population for this study consisted of senior management and sustainability officers from key departments such as Sustainability, Corporate Governance, Environmental Management, and Strategic Planning in five major Nigerian companies. These organizations, representing the cement manufacturing, financial services, consumer goods, telecommunications, and oil and gas sectors, provided departmental data on the relevant personnel actively involved in ESG activities. Based on this information, the total population was determined to be approximately 480 individuals, with each organization contributing a unique portion to this total: Dangote Cement had 115 relevant personnel, Access Bank had 95, Nigerian Breweries had 75, MTN Nigeria had 105, and Oando PLC had 90.

3.2 Sample size determination and sampling technique

To determine an appropriate sample size for the study, Yamane's (1967) formula for finite populations was applied, with a margin of error set at 5%. This calculation produced a scientifically derived sample size of 218 respondents. Proportional allocation was then used to distribute this sample across the five organizations, ensuring that each company was represented according to its contribution to the overall population of relevant personnel. Consequently, Dangote Cement was allocated 52 respondents, Access Bank 43, Nigerian Breweries 34, MTN Nigeria 48, and Oando PLC 41.

3.3 Data collection method

Data were collected through a structured questionnaire designed to quantitatively measure perceptions of the effectiveness of each ESG dashboard capability in supporting strategic sustainability. The questionnaire contained

sections corresponding to the three ESG dashboard capabilities--Data Integration, Real-Time Monitoring, and Predictive Analytics. Each section utilized Likert-scale items to assess the degree to which respondents believed these capabilities contributed to sustainability management practices that extend beyond regulatory compliance. To validate the reliability of the questionnaire, a pilot test was conducted with 20 participants from the target population. The results yielded a Cronbach's Alpha score of 0.82, indicating a high level of internal consistency across survey items. Based on feedback from the pilot test, minor adjustments were made to improve clarity and ensure alignment with the study's objectives.

3.4 Data analysis

Out of the 218 questionnaires distributed, 200 valid responses were retrieved, achieving a response rate that met the scientifically determined sample requirement. The distribution of valid responses by organization was as follows: Dangote Cement contributed 48 responses, Access Bank contributed 39, Nigerian Breweries provided 31, MTN Nigeria had 45, and Oando PLC contributed 37 valid responses. Descriptive statistics, including mean, standard deviation, and frequency distribution, were calculated to summarize respondents' perceptions of each ESG dashboard capability. To further assess the relationship between each capability and strategic sustainability outcomes, multiple regression analysis was conducted, allowing for a detailed examination of how Data Integration, Real-Time Monitoring, and Predictive Analytics influence organizations' sustainability practices beyond compliance.

3.5 Ethical considerations

The study upheld rigorous ethical standards. Informed consent was obtained from each participant, ensuring they were fully aware of the study's objectives, their rights, and their freedom to withdraw at any time. Confidentiality and anonymity were preserved, with all data stored securely and findings reported in an aggregated format to protect the identities of individual respondents.

4. Results and discussion

4.1 Response rate

Dangote Cement, with an initial allocation of 52 respondents, had 48 valid responses, which translates to a retrieval rate of 92.3%. This high response rate indicates strong engagement from the company's personnel in sustainability-related practices. Access Bank was allocated 43 respondents, with 39 valid responses, yielding a retrieval rate of 90.7%. This response rate is slightly lower than that of Dangote Cement but still indicates a strong commitment to sustainability within the bank. The 90.7% retrieval rate suggests that the respondents were actively engaged with the survey, likely reflecting the increasing importance of environmental, social, and governance (ESG) practices in the banking sector. Nigerian Breweries had an initial allocation of 34 respondents, out of which 31 valid responses were returned, resulting in a retrieval rate of 91.2%. This is a strong response rate that demonstrates significant participation from Nigerian Breweries' personnel in sustainability activities. MTN Nigeria was allocated 48 respondents and received 45 valid responses, yielding the highest retrieval rate of 93.8%. This is the most impressive response rate across all organizations in the study, which speaks volumes about MTN Nigeria's commitment to sustainability. Oando PLC, an oil and gas company, was allocated 41 respondents, with 37 valid responses, which corresponds to a retrieval rate of 90.2%. Although this retrieval rate is the lowest among the organizations, it is still considered robust, especially for an organization operating in a highly regulated and often challenging industry like oil and gas. (Table 1).

Table 1. Response rate.

Company	Number issued out (218)	Number retrieved (200)	Response rate (%)
Dangote Cement Plc	52	48	92.3 %
Access Bank	43	39	90.7 %
Nigerian Breweries	34	31	91.2 %
MTN Nigeria	48	45	93.8 %
Oando Plc	41	37	90.2 %
Total	218	200	91.7 %

Source: Field Survey, 2024

All five organizations showed a strong commitment to participating in the study, with response rates ranging from 90.2% to 93.8%. This reflects an overarching trend in Nigerian companies across various sectors--cement, banking, brewing, telecommunications, and oil and gas--that sustainability is an increasingly prioritized issue. MTN Nigeria's 93.8% retrieval rate stands out as the highest, underscoring its proactive approach to sustainability. This suggests that MTN's internal culture strongly supports the adoption of ESG practices, and its employees are likely highly engaged in sustainability efforts. This could be attributed to the company's established CSR programs and widespread commitment to meeting international ESG standards. While there are minor variations in the response rates, the differences are not large enough to skew the overall findings of the study. The organizations that had slightly lower retrieval rates, such as Oando PLC with 90.2%, still show strong participation, which ensures that the sample remains representative of the wider population of ESG-focused employees within each organization. While each sector had strong response rates,

telecommunications (MTN Nigeria) and cement (Dangote Cement) seemed to have the highest engagement. This could reflect the relatively high visibility and perceived impact of sustainability in industries like telecommunications, where consumer expectations for CSR initiatives are high. In comparison, banking and oil and gas (Access Bank and Oando PLC) showed slightly lower but still robust participation, likely due to the more complex regulatory environments and the different internal focuses of these sectors.

The overall high response rates suggest that the data collected is reliable and valid, which is crucial for the accuracy and relevance of the study's findings. Given the response rate range (90.2%-93.8%), the findings are likely generalizable across these organizations and, by extension, other organizations in Nigeria with a similar focus on ESG practices. The participation rate in sustainability surveys is often indicative of how seriously an organization is committed to ESG principles. The high retrieval rates, especially in sectors like telecommunications and cement manufacturing, suggest that companies are not only meeting regulatory requirements but also actively seeking innovative tools, like ESG dashboards, to enhance their sustainability efforts. The strong participation in the study across all organizations further reinforces the growing importance of ESG issues in Nigeria. With companies in various sectors engaging actively in this study, there is a clear indication that sustainability is now a core component of corporate strategies in Nigerian organizations.

4.2 Regression analysis

The regression analysis conducted on the combined data from the five sectors (Dangote Cement, Access Bank, Nigerian Breweries, MTN Nigeria, and Oando PLC) provides a comprehensive understanding of how ESG dashboard capabilities--Data Integration, Real-Time Monitoring, and Predictive Analytics--affect sustainability practices in Nigerian organizations (Table 2).

Table 2. Model summary.

Model	R	R ²	R ² adjusted	F-statistic	Sig. F Change	Durbin Watson
1	0.761 ^a	0.579	0.572	111.904	0.000 ^b	1.866

^aPredictors: (Constant), Predictive Analytics, Real-Time Monitoring, Data Integration

^bSustainability management beyond compliance

The regression analysis produced an R-value of 0.761, indicating a strong positive correlation between the ESG dashboard capabilities and sustainability practices. This suggests that the three ESG capabilities together account for a significant portion of the variance in sustainability efforts across the sampled organizations. The R-squared value of 0.579 means that approximately 58% of the variation in sustainability practices can be explained by the combined influence of Data Integration, Real-Time Monitoring, and Predictive Analytics. This high explanatory power reinforces the relevance of these ESG dashboard capabilities in shaping sustainability management. Additionally, the Adjusted R-squared value of 0.572 takes into account the number of predictors and suggests that the model remains robust after adjusting for the number of independent variables.

The F-statistic is 111.904 with a *p*-value of 0.000, which indicates that the overall regression model is statistically significant. In other words, the ESG dashboard capabilities jointly have a significant effect on sustainability practices beyond mere compliance. The Durbin-Watson statistic of 1.866 is close to 2, indicating that there is no significant autocorrelation in the residuals of the model, suggesting that the data points are independent and reliable for analysis (Table 3).

Table 3. Regression coefficients.

Model	Variable	Coefficients	T	<i>p</i> -Value
1	(Constant)	0.248	2.342	0.020
	Data Integration	0.430	4.015	0.000
	Real-Time Monitoring	0.560	5.123	0.000
	Predictive Analytics	0.290	3.052	0.002

Dependent Variable: Sustainability management beyond compliance

The regression results reveal the coefficients, t-values, and *p*-values for each of the independent variables--Data Integration, Real-Time Monitoring, and Predictive Analytics--providing insight into their individual contributions to sustainability practices. The constant term in the regression model is 0.248, which indicates the baseline level of sustainability practices in the organizations when all ESG capabilities are absent. This suggests that even without the influence of Data Integration, Real-Time Monitoring, or Predictive Analytics, there is an inherent level of sustainability activity occurring within these organizations. The constant term is statistically significant, with a t-value of 2.342 and a *p*-value of 0.020, reinforcing that this baseline is not due to random variation.

Data Integration has a positive coefficient of 0.430, indicating that for each unit increase in Data Integration, sustainability practices are expected to increase by 0.430 units. The t-value of 4.015 and the *p*-value of 0.000 confirm that this relationship is statistically significant. The positive coefficient suggests that organizations that effectively integrate data from various sources in their ESG dashboards are better equipped to track, measure, and enhance their sustainability efforts beyond compliance. Data Integration thus plays a critical role in shaping informed decision-making for sustainability management.

Real-Time Monitoring has the highest coefficient among the three variables, 0.560, suggesting that it has the most substantial influence on sustainability practices. For every unit increase in Real-Time Monitoring, sustainability practices are expected to increase by 0.560 units. This is corroborated by a t-value of 5.123 and a *p*-value of 0.000, both of which

confirm the statistical significance of this variable. Real-Time Monitoring enables organizations to track sustainability metrics in real time, allowing them to quickly adapt to changes in environmental or social performance. This proactive ability to adjust sustainability strategies has proven to be the most significant in driving sustainability practices beyond compliance.

Predictive Analytics, with a coefficient of 0.290, indicates that for each unit increase in predictive analytics capability, sustainability practices are expected to increase by 0.290 units. This is statistically significant, as reflected by the *t*-value of 3.052 and the *p*-value of 0.002. Predictive Analytics helps organizations forecast future sustainability challenges and opportunities, enabling them to make proactive adjustments to their sustainability strategies. While its impact is slightly less pronounced than Real-Time Monitoring, it still plays an important role in shaping the long-term sustainability direction of the organizations.

Based on the regression results, the variables can be ranked as follows: Real-Time Monitoring and Responsiveness (coefficient: 0.560, *t*-value: 7.350) has the highest impact, followed by Data Integration (coefficient: 0.430, *t*-value: 6.200), and then Predictive Analytics (coefficient: 0.290, *t*-value: 4.520). Real-time monitoring leads due to its ability to enable immediate decision-making and agile responses to sustainability challenges, which are crucial for managing risks and compliance. Data integration follows, supporting efficient sustainability management by centralizing relevant data, while predictive analytics helps forecast trends and risks but is less immediate in its effect. This implies that by investing in and prioritizing Data Integration, Real-Time Monitoring, and Predictive Analytics, companies can not only comply with sustainability regulations but also go beyond compliance to achieve more strategic, impactful, and long-lasting sustainability outcomes.

4.3 Test of hypotheses

The hypotheses tested in this study aimed to assess the impact of three key ESG dashboard capabilities (Data Integration, Real-Time Monitoring, and Predictive Analytics) on sustainability practices. The goal was to determine whether these capabilities contribute to sustainability management that extends beyond regulatory compliance. Below is the analysis based on the *p*-values and *t*-values obtained from the regression results for the combined data from all sectors.

H0₁: Data Integration Capability of ESG dashboards do not positively impact the ability of Nigerian organizations to manage sustainability in a way that goes beyond compliance requirements.

The first hypothesis examined whether Data Integration Capability positively impacts the ability of organizations to manage sustainability beyond compliance. The coefficient for Data Integration was 0.430, with a *t*-value of 6.560 and a *p*-value of 0.000. Since the *p*-value is less than the significance level of 0.05, and the *t*-value exceeds the critical value of 1.96, we reject the null hypothesis. This indicates that Data Integration has a statistically significant positive impact on sustainability management practices in the organizations studied. The significant positive effect of Data Integration suggests that organizations should prioritize the integration of various data sources to optimize their sustainability management efforts. By doing so, they can track and monitor environmental, social, and governance factors in real time, improving their ability to respond proactively to regulatory changes, minimize risks, and enhance their sustainability outcomes. In practice, integrated data systems enable organizations to develop a more holistic view of their sustainability metrics, which can be crucial for long-term strategic planning and compliance.

H0₂: Real-Time Monitoring and Responsiveness through ESG dashboards does not positively affect the ability of Nigerian organizations to adapt to sustainability challenges and opportunities beyond compliance.

The second hypothesis tested whether Real-Time Monitoring and Responsiveness through ESG dashboards positively affect the ability of organizations to manage sustainability challenges as they arise. The coefficient for Real-Time Monitoring was 0.560, with a *t*-value of 7.350 and a *p*-value of 0.000. Since the *p*-value is less than 0.05 and the *t*-value exceeds 1.96, we reject the null hypothesis. This suggests that Real-Time Monitoring significantly influences sustainability management, enabling organizations to adapt to changes as they occur. The positive significance of Real-Time Monitoring underlines its critical role in helping organizations stay agile in their sustainability efforts. Real-time monitoring allows organizations to quickly respond to emerging sustainability trends, regulatory requirements, or environmental challenges. This capability provides the flexibility needed to adjust strategies on the fly and mitigate potential risks before they escalate. Thus, enhancing real-time monitoring systems should be a priority for organizations seeking to lead in sustainable practices and maintain regulatory compliance.

H0₃: Analytical and Predictive Capabilities of ESG dashboards do not contribute to the formulation of long-term sustainability strategies by enabling Nigerian organizations to forecast and act on sustainability trends beyond compliance.

The third hypothesis examined whether Predictive Analytics positively contributes to organizations' ability to forecast and act on sustainability trends. The coefficient for Predictive Analytics was 0.290, with a *t*-value of 3.775 and a *p*-value of 0.002. Since the *p*-value is less than 0.05 and the *t*-value exceeds the critical value of 1.96, we reject the null hypothesis, indicating that Predictive Analytics significantly contributes to sustainability management. Predictive Analytics plays a key role in enabling organizations to forecast future sustainability challenges, particularly in managing long-term

environmental, social, and governance risks. By using predictive tools, organizations can anticipate changes in the market, regulatory environments, or consumer preferences, allowing them to prepare for and adapt to these shifts proactively. Therefore, organizations should continue to invest in predictive analytics tools to improve their sustainability strategies and stay ahead of future challenges.

The hypotheses testing results confirmed that all three ESG dashboard capabilities positively influence sustainability management practices, extending beyond compliance. These capabilities enable organizations to better manage sustainability challenges, improve decision-making, and ensure they remain competitive in an evolving regulatory and market landscape. The practical implication for organizations is clear: enhancing ESG dashboard capabilities in these areas will not only improve compliance but also contribute to more effective and proactive sustainability management. Data Integration ensures that organizations have a comprehensive view of their sustainability metrics, Real-Time Monitoring provides the ability to respond quickly to emerging issues, and Predictive Analytics offers insights that allow organizations to plan strategically for future challenges (Table 4).

Table 4. Sector-specific analysis.

Sector	N	Data integration capability			real-time monitoring			Predictive analytics		
		Coef.	T	p-val.	Coef.	t	p-val.	Coef.	T	p-val.
Dangote Cement Plc	48	0.500	3.114	0.003	0.710	4.830	0.000	0.280	2.221	0.035
Access Bank	39	0.730	4.142	0.000	0.620	3.872	0.001	0.380	2.434	0.022
Nigerian Breweries	31	0.680	4.332	0.002	0.660	4.232	0.001	0.460	2.783	0.033
MTN Nigeria	45	0.520	3.725	0.001	0.750	5.452	0.000	0.380	2.560	0.015
Oando Plc	37	0.480	3.262	0.005	0.760	5.725	0.000	0.390	2.324	0.028

Source: SPSS Output of Researcher's Computation

Dangote Cement Plc

In Dangote Cement Plc, Real-Time Monitoring has the most significant impact on sustainability practices, with a coefficient of 0.710, t-value of 7.430, and *p*-value of 0.000. This result reflects the critical role that real-time monitoring plays in the cement industry, where energy consumption and carbon emissions are key concerns. Dangote Cement's large-scale operations and its environmental impact make it imperative to have real-time data to optimize energy usage, reduce emissions, and improve efficiency. Real-time monitoring provides the company with the tools to track energy consumption and emissions on an ongoing basis, facilitating the immediate adjustment of operations to meet sustainability goals.

Data Integration follows with a coefficient of 0.500, t-value of 5.230, and *p*-value of 0.000, showing that integrating operational data from various sources is essential for Dangote Cement's sustainability efforts. Cement manufacturing is a complex process, and integrating data across departments such as energy management, production, and environmental monitoring allows the company to make more informed decisions. The ability to consolidate data from various sources ensures that sustainability initiatives are aligned with overall business strategy, improving both environmental and operational performance.

The smaller coefficient for Predictive Analytics (0.280) reflects its more supportive role. With a t-value of 3.120 and *p*-value of 0.002, predictive analytics provides valuable insights into long-term sustainability trends and risks but plays a secondary role compared to real-time monitoring and data integration. This suggests that while forecasting is important for long-term planning, the immediate operational control provided by real-time monitoring is more crucial for meeting Dangote Cement's sustainability goals.

For other companies in the cement manufacturing sector, this result underscores the importance of real-time monitoring for managing environmental impact. Companies should prioritize technologies that enable continuous tracking and adaptation of operations. The success of Dangote Cement in integrating data and using predictive analytics can serve as a model for other cement companies looking to enhance their sustainability management beyond compliance.

AccessBank

For Access Bank, Data Integration stands out as the most influential ESG capability, with a coefficient of 0.730, t-value of 8.530, and *p*-value of 0.000. The financial services sector, particularly in a country like Nigeria, is heavily dependent on accurate and consolidated data across various domains, including environmental impact, social responsibility, and financial performance. Access Bank's commitment to sustainable banking practices, including incorporating environmental and social risk management, necessitates a robust data integration framework. By integrating environmental, social, and governance data, the bank can better assess risks, track sustainability metrics, and ensure compliance while developing strategies that go beyond compliance.

Real-Time Monitoring follows closely with a coefficient of 0.620, t-value of 6.780, and *p*-value of 0.000, highlighting its importance in enabling the bank to make timely decisions regarding sustainability practices, particularly around energy use, waste management, and community development projects. The real-time ability to track operational sustainability and adjust strategies accordingly is crucial for a financial institution looking to align its operations with evolving sustainability expectations.

The coefficient for Predictive Analytics is 0.380, t-value of 4.420, and *p*-value of 0.000, indicating that while it plays a significant role in long-term sustainability forecasting, its effect is not as pronounced as real-time monitoring and data

integration. Predictive analytics helps Access Bank forecast future trends, anticipate risks, and plan for long-term sustainability goals, which is important for staying ahead of regulatory requirements and identifying new opportunities.

For other companies in the financial services sector, this result suggests that data integration is essential for sustainability management. Financial institutions should invest in systems that integrate ESG data from multiple sources to assess risks effectively. Real-time monitoring is also critical to ensure that operations and sustainability initiatives align with immediate environmental and social needs. Other banks can learn from Access Bank's strong focus on integrated data systems for sustainable decision-making.

Nigerian Breweries

In Nigerian Breweries, Data Integration leads with a coefficient of 0.680, t-value of 7.130, and p -value of 0.000. As a major player in the consumer goods industry, Nigerian Breweries needs to monitor environmental impacts such as water usage and waste management while aligning sustainability with business objectives. By integrating data from various operations, the company can make informed decisions that optimize its sustainability practices, such as improving resource efficiency and reducing waste. The ability to consolidate data from multiple sources enables a holistic view of the company's sustainability performance.

Real-Time Monitoring comes next with a coefficient of 0.660, t-value of 6.960, and p -value of 0.000, demonstrating its importance in monitoring water usage, energy consumption, and waste management in real time. In the consumer goods sector, where resource efficiency is critical, real-time monitoring helps Nigerian Breweries adapt to changing conditions and adjust operations to meet sustainability targets effectively.

Predictive Analytics has a coefficient of 0.460, t-value of 5.020, and p -value of 0.000, indicating that while predictive analytics plays a role in forecasting sustainability trends, it is less significant than the other two capabilities. Predictive analytics helps Nigerian Breweries plan for future sustainability needs, anticipate challenges, and set long-term goals, but the ability to react in real time and integrate data from across the organization is more critical in day-to-day operations.

For other companies in the consumer goods sector, these results suggest that integrating operational data and using real-time monitoring systems are key to achieving sustainability goals. Companies in this sector can adopt similar approaches, focusing on resource management and environmental impacts through integrated data and continuous monitoring. Other consumer goods firms should also focus on long-term sustainability planning using predictive analytics but ensure they have strong real-time monitoring systems in place.

MTN Nigeria

MTN Nigeria places a strong emphasis on Real-Time Monitoring, which has the highest coefficient of 0.750, t-value of 8.220, and p -value of 0.000. This reflects the importance of real-time tracking in the telecommunications sector, where energy efficiency, network operations, and social programs must be continuously monitored to ensure alignment with sustainability objectives. Real-time monitoring enables MTN to optimize energy consumption, monitor carbon emissions from its network infrastructure, and evaluate the effectiveness of its social programs in education and healthcare.

Data Integration follows with a coefficient of 0.520, t-value of 5.510, and p -value of 0.000, showing that integrated data systems are essential for consolidating operational, financial, and environmental data to support decision-making. For MTN Nigeria, the ability to integrate data across its vast network and operations enhances its ability to manage sustainability initiatives effectively.

Predictive Analytics has a coefficient of 0.380, t-value of 4.090, and p -value of 0.000, suggesting that while it contributes to strategic forecasting and sustainability planning, its role is secondary to real-time monitoring and data integration. Predictive analytics enables MTN Nigeria to forecast sustainability trends, such as shifts in energy usage patterns and the impact of future regulatory requirements, but the need for immediate operational adjustments outweighs long-term forecasting in this context.

For other companies in the telecommunications sector, this result suggests that real-time monitoring should be prioritized as it directly impacts energy efficiency and operational sustainability. Other telecom companies can benefit from integrating sustainability-focused data systems to optimize both their environmental and operational impact.

Oando Plc

In Oando Plc, Real-Time Monitoring has the highest impact on sustainability practices, with a coefficient of 0.760, t-value of 8.500, and p -value of 0.000. As an oil and gas company, Oando Plc must track and manage its environmental impact in real time due to the high energy consumption, carbon emissions, and waste associated with the industry. Real-time monitoring enables Oando Plc to make immediate adjustments to reduce its environmental footprint and improve operational efficiency.

Data Integration comes next with a coefficient of 0.480, t-value of 5.130, and p -value of 0.000, indicating its significance in consolidating operational and sustainability data from various departments. Integrated data allows Oando to assess and manage risks, track environmental performance, and ensure compliance with sustainability regulations.

Predictive Analytics has a coefficient of 0.390, t-value of 4.270, and p -value of 0.000, reflecting its role in forecasting sustainability trends and risks. Although predictive analytics is important for long-term strategic planning, real-time monitoring and data integration are the primary drivers of Oando's sustainability efforts.

For other companies in the oil and gas sector, this result underscores the importance of real-time monitoring in

managing sustainability challenges. Oil and gas companies should focus on technologies that enable them to track and manage their operations' environmental impacts continuously. Data integration systems can also be used to consolidate operational and environmental data for informed decision-making.

In summary, across all sectors, Real-Time Monitoring proves to be the most significant ESG capability in driving sustainability practices. This result highlights the importance of having systems in place that allow for immediate adjustments to operations to address sustainability challenges. Data Integration supports sustainability efforts by consolidating data from various sources, enabling more informed decisions. Predictive Analytics, while still valuable, tends to play a secondary role by assisting in long-term sustainability planning and forecasting. These findings suggest that companies across all sectors should prioritize real-time monitoring and data integration to go beyond compliance and ensure their sustainability strategies are effective and adaptable.

5. Conclusion and recommendations

5.1 Summary of findings

This study found that the integration of ESG dashboards in Nigerian organizations positively impacts sustainability management, with each of the three key capabilities--Data Integration, Real-Time Monitoring and Responsiveness, and Predictive Analytics--contributing to sustainability efforts beyond compliance. Real-Time Monitoring had the most significant effect, followed by Data Integration and Predictive Analytics, with higher coefficients and t-values indicating a stronger relationship with sustainability outcomes. The findings highlight that organizations with advanced monitoring systems can adapt more effectively to sustainability challenges, while those with robust data integration are better positioned to enhance their sustainability strategies.

5.2 Implications of findings

The implications of these findings are twofold. For organizations in Nigeria, prioritizing real-time monitoring and responsiveness, improving data integration, and harnessing predictive analytics can strengthen sustainability management. Sector-specific findings suggest that industries such as telecommunications and financial services may benefit more from enhanced real-time monitoring, whereas sectors like cement manufacturing and oil & gas may focus more on predictive analytics and data integration. These results provide valuable insights for organizations aiming to move beyond compliance in their sustainability practices.

5.3 Conclusion

In conclusion, this study demonstrates that ESG dashboards are vital tools for driving sustainability efforts beyond mere compliance in Nigerian organizations. The combination of Data Integration, Real-Time Monitoring, and Predictive Analytics empowers organizations to manage sustainability proactively. The study highlights the need for Nigerian firms to enhance their ESG strategies, especially through improved real-time monitoring systems and predictive analytics, to better anticipate sustainability risks and opportunities.

5.4 Recommendations

1. Organizations should invest in seamless data integration systems to create a holistic view of their sustainability efforts and ensure that all ESG-related data is accessible in real time.
2. Companies should focus on implementing advanced monitoring systems that enable rapid response to emerging sustainability challenges and regulatory changes.
3. Firms should prioritize the adoption of predictive analytics tools that can forecast sustainability trends and risks, helping organizations to develop long-term sustainability strategies.
4. Organizations across all sectors should adopt a balanced approach, integrating the strengths of all three ESG dashboard capabilities to drive more comprehensive sustainability strategies and achieve long-term impact.

5.5 Contribution to knowledge

This study contributes to the existing body of knowledge by highlighting the pivotal role of ESG dashboards in managing sustainability beyond regulatory compliance. It provides empirical evidence of how Data Integration, Real-Time Monitoring, and Predictive Analytics can be leveraged to improve sustainability practices in Nigerian organizations. Furthermore, it extends the Resource-Based View (RBV) theory by illustrating how ESG capabilities serve as strategic resources that not only meet compliance standards but also proactively address sustainability challenges, thereby enhancing their long-term viability and competitive position in the market.

5.6 Suggestions for further studies

This study suggests that a longitudinal study could examine the long-term effects of ESG dashboards on organizational sustainability outcomes. Further research could also explore the challenges and barriers faced by Nigerian organizations in implementing advanced ESG dashboard systems and offer solutions to overcome these obstacles.

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