Integrating Sustainable Business Practices, Digital Transformation, and Strategic Management for Competitive Advantage and Organizational Performance in Nigerian Manufacturing Firms

Okonkwo Faith Odinakachi [#1], Osadunmi Ropo Joshua[*2], Joseph Joy Ojochide [#3]

[#1]*Department of Business Administration, Anambra State University Uli. Nigeria, Department of Business Administration, Esgt University Benin Republic. Nigeria*[*2]*, Department of Business Administration and Management, ADECOM College Of Business and Management, Oyo state, Nigeria*[#3]

[1]faithknkw@gmail.com, [2]joedunmi01@gmail.com, Joyjudithjoe@gmail.com

***Abstract*—**Nigerian manufacturing firms operate in a challenging environment characterised by high operating costs, infrastructure constraints, and increasing stakeholder expectations for both sustainability and technology-enabled efficiency. Despite growing interest in sustainable business practices and digital transformation, many firms implement these initiatives as parallel projects rather than integrated strategic capabilities that can generate defensible competitive advantage and improved organisational performance. This study investigates how sustainable business practices, digital transformation capability, and strategic management capability jointly influence competitive advantage and organisational performance in Nigerian manufacturing firms, and whether competitive advantage mediates these relationships while strategic management capability strengthens them. Using a quantitative, explanatory cross-sectional design, data were collected from managers across multiple manufacturing subsectors and analysed using structural equation modelling. The results show that sustainable business practices and digital transformation capability both have positive and significant effects on competitive advantage and organisational performance, with digital transformation showing a comparatively stronger effect on competitive advantage. Competitive advantage demonstrates a strong positive relationship with organisational performance and partially mediates the effects of sustainability and digital transformation on performance, indicating that these capabilities create value most effectively when they translate into market-facing advantages. Strategic management capability positively influences competitive advantage and significantly moderates the relationships between sustainability and competitive advantage as well as digital transformation and competitive advantage, confirming that strategic alignment and execution discipline amplify the competitive returns of sustainability and digital investments. The study concludes that Nigerian manufacturers achieve superior performance when sustainability and digital transformation are strategically integrated and managed as complementary capability bundles, rather than pursued as isolated compliance or technology initiatives. The findings provide a practical roadmap for managers seeking to improve competitiveness through integrated sustainability digital strategies and contribute to capability-based explanations of performance in emerging-economy manufacturing contexts.

Keywords: sustainable business practices; digital transformation; strategic management capability; competitive advantage; organisational performance; Nigerian manufacturing firms.

I. INTRODUCTION

Nigeria's manufacturing sector sits at the centre of the country's industrialisation and jobs agenda, yet firms operate in a high-friction environment shaped by energy unreliability, infrastructure gaps, currency volatility, and intense import competition. Recent industry reporting indicates that manufacturers' spending on alternative energy rose sharply in 2024, reflecting how power constraints directly raise unit costs and weaken productivity and output stability (Nwafor, 2025; Moses et al., 2025). In this context, the search for competitive advantage is no longer limited to traditional cost leadership or differentiation logic; it increasingly depends on how well firms combine sustainable business practices, digital transformation, and strategic management to build resilient, efficient, and reputationally credible operations (Porter, 1985; Barney, 1991; Teece et al., 1997). At the same time, sustainability expectations are becoming more formalised through global standards and national adoption pathways. Sustainability reporting frameworks often operationalised through environmental management systems and structured disclosure standards have moved from voluntary signalling to a governance and investor-relevance issue (ISO, 2015; GRI, 2021). Nigeria has also advanced a phased roadmap for adopting IFRS Sustainability Disclosure Standards, signalling stricter expectations for how firms disclose climate- and sustainability-related risks and opportunities (FRCN, 2024; Anyaogu, 2024; KPMG Nigeria, 2025). For manufacturing firms, this shift matters because sustainability is increasingly linked to access to capital, export market legitimacy, supplier qualification, and long-run risk management outcomes that ultimately shape competitive positioning.

Empirically, a growing stream of Nigerian and international research suggests that sustainability-oriented practices can improve organisational outcomes, but the pathways are neither automatic nor uniform. For example, evidence from listed Nigerian manufacturing firms shows that sustainability-related practices and disclosures can relate to firm viability and performance proxies such as going concern indicators and net asset metrics when embedded into governance and workplace systems (Boluwaji et al., 2024; Tiamiyu et al., 2021). Other Nigeria-focused studies similarly connect sustainability practices and reporting to competitiveness and performance, reinforcing the argument that environmental and social initiatives can be strategically valuable rather than merely philanthropic (Onayemi et al., 2022; Nwaobia & Akintoye, 2024; Mbang et al., 2020). Yet, the Nigerian evidence base also points to uneven implementation capacity driven by firm size, governance quality, and resource constraints implying that sustainability benefits depend on managerial alignment and execution discipline rather than adoption alone (Tiamiyu et al., 2021; Barney, 1991; Hart, 1995). Digital transformation adds a second, increasingly decisive layer to this discussion. Industry 4.0 technologies and digitally enabled processes (e.g., analytics, automation, cloud systems, and digitally integrated supply chains) are widely argued to enhance efficiency, transparency, responsiveness, and innovation capabilities that can strengthen both sustainability outcomes and competitive advantage (Guandalini, 2022; Zhang et al., 2022). Evidence also indicates that digital transformation can support sustainability-oriented performance channels such as lower production costs, higher labour productivity, and improved innovation throughput, though it can introduce new organisational costs and capability requirements (Zhang et al., 2022; Teece et al., 1997). Within the Nigerian setting, emerging studies argue that digital transformation can improve efficiency and performance, but the extent of benefit depends on complementary organisational capabilities and the strategic coherence of the transformation programme (Adeyinka, 2023; Xue et al., 2022). Strategic management provides the integrating logic that determines whether sustainability and digital initiatives become fragmented projects or a coherent competitive strategy. Classic strategy scholarship explains advantage through the ability to configure valuable resources and capabilities and to adapt them under change (Porter, 1985; Barney, 1991; Teece et al., 1997). Extending this, the natural-resource-based view argues that environmental capabilities (e.g., pollution prevention, product stewardship, sustainable development routines) can be sources of sustained advantage when they are difficult to imitate and embedded in organisational processes (Hart, 1995). In Nigeria, firm-level research indicates that strategic planning, implementation, and evaluation practices are positively associated with competitiveness and performance in manufacturing contexts, suggesting that "how" firms manage strategy is a key differentiator in turbulent environments (Abalaka, 2023; Obieze, 2023). However, much of the existing literature treats sustainability, digital transformation, and strategy as parallel predictors of performance rather than as mutually reinforcing systems.

This study is motivated by that integration gap. While prior work has examined (i) sustainability practices and disclosures in Nigerian manufacturing (Boluwaji et al., 2024; Tiamiyu et al., 2021; Nwaobia & Akintoye, 2024), (ii) digital transformation and competitive advantage mechanisms (Guandalini, 2022; Zhang et al., 2022; Xue et al., 2022), and (iii) strategic management effects on performance (Abalaka, 2023; Obieze, 2023), there remains limited empirical clarity on how Nigerian manufacturing firms can combine these three domains to drive competitive advantage and organisational performance simultaneously. Accordingly, the present research frames sustainability and digital transformation as capability-building agendas that require strategic alignment linking governance, processes, technology investment, and stakeholder expectations so that firms can achieve not only short-term efficiency gains but also longer-run resilience, legitimacy, and performance improvements (Porter & Kramer, 2011; Teece et al., 1997; FRCN, 2024)

II. LITERATURE REVIEW

A. Sustainable business practices and organisational performance

Sustainable business practices (SBPs) in manufacturing commonly span environmental management (e.g., waste and emissions control), social responsibility (e.g., labour practices, community impact) and governance/ethics, often framed through the triple-bottom-line logic (Elkington, 1997) and the "shared value" argument that firms can create economic value while addressing societal constraints (Porter & Kramer, 2011). In strategic management research, sustainability-performance links are frequently theorised via the resource-based view and its extensions: firms can build valuable, rare and hard-to-imitate capabilities (Barney, 1991), including pollution prevention and product stewardship routines (Hart, 1995), that become sources of sustained advantage. Empirically, the "business case" for sustainability is supported by large-sample syntheses and meta-analyses. Many research studies such as Orlitzky, Schmidt & Rynes (2003); Endrikat, Guenther & Hoppe (2014); Friede, Busch & Bassen (2015); and Kotsantonis, Pinney & Serafeim (2016) report that environmental/social performance and disclosures are often positively associated with financial performance, although effect sizes vary by measurement choices, time horizon and context. A complementary stream argues that environmental innovation and resource productivity improvements can enhance competitiveness rather than necessarily imposing costs an idea associated with the Porter–van der Linde perspective (Porter & van der Linde, 1995). Operationally, SBPs are increasingly institutionalised through formal management systems and reporting frameworks. Many research studies such as ISO (2015); GRI (2021); and ISSB/IFRS (2023a, 2023b) highlight how environmental management systems and sustainability disclosure standards shape internal measurement, governance processes and external legitimacy mechanisms that can indirectly affect market access, capital cost and stakeholder trust. In manufacturing, sustainability is also frequently operationalised through sustainable business model innovation and supply-

chain redesign. Many research studies such as Bocken, Short, Rana & Evans (2014); Schaltegger & Wagner (2011); and Porter & Kramer (2011) link sustainability to new value propositions, cleaner production, and broader stakeholder-oriented strategy.

B. Digital transformation and manufacturing competitiveness

Digital transformation (DT) is generally conceptualised as an enterprise-wide process where digital technologies reshape operations, customer experience and business models rather than a narrow "IT upgrade." Many research studies such as Vial (2019); Bharadwaj, El Sawy, Pavlou & Venkatraman (2013); and Sebastian, Ross, Beath, Mocker, Moloney & Fonstad (2017) emphasise DT as a strategic phenomenon involving governance, capabilities and organisational redesign. This aligns with strategic alignment arguments that performance benefits require fit between business strategy, IT strategy and organisational infrastructure (Henderson & Venkatraman, 1993). In manufacturing, DT is often connected to Industry 4.0 technologies (IoT, analytics, automation, connectivity) that enhance visibility, traceability and responsiveness. Many research studies such as Stock & Seliger (2016); Kamble, Gunasekaran & Sharma (2018); and Wu, Chou, Chien & Lin (2024) discuss how digital readiness, data capabilities and process integration shape DT maturity and outcomes in production settings. The literature also recognises uneven payoffs: DT can be capital-intensive, skill-sensitive, and slower to yield efficiency gains in constrained environments meaning firms may experience short-run disruption before performance improvements materialise (Wu et al., 2024).

C. Strategic management foundations linking SBPs and DT to performance

Strategic management provides the integrative logic for explaining when SBPs and DT translate into competitive advantage and organisational performance. Classical positioning arguments view advantage as stemming from unique activity systems and deliberate strategic choices (Porter, 1985; Porter, 1996). Capability-based arguments focus on how firms build and reconfigure resources over time under uncertainty (Teece, Pisano & Shuen, 1997). Dynamic capability theory further explains how firms "sense, seize and reconfigure" in turbulent environments, which is particularly relevant for digital disruption and sustainability transitions (Teece, 2007). Strategic management research also highlights measurement and execution systems as bridges between strategy and performance. Many research studies such as Kaplan & Norton (1992) argue that multi-dimensional performance systems (financial, customer, internal process, learning and growth) help align initiatives to strategy and track trade-offs especially relevant when firms pursue both sustainability and digital initiatives simultaneously.

D. Integrating SBPs, DT and strategy: complementarities and capability bundles

A key theme in recent scholarship is complementarity: SBPs and DT may reinforce each other when integrated under coherent strategic management. DT can enable sustainability through real-time monitoring, predictive maintenance, energy optimisation, quality control, and traceability across supply chains; conversely, sustainability goals can prioritise high-value digital use cases (e.g., carbon/energy efficiency, circularity tracking) and improve adoption legitimacy among stakeholders. Many research studies such as Vial (2019); Stock & Seliger (2016); and Schaltegger & Wagner (2011) imply that the performance impact of DT depends on how firms recombine digital assets with organisational routines and sustainability-oriented innovation. Dynamic capabilities provide a unifying explanation for this integration. Many research studies such as Warner & Wäger (2019); Teece (2007); and Teece et al. (1997) argue that firms need higher-order capabilities (strategic agility, orchestration, renewal) to convert technological change into sustained performance. Similarly, alignment perspectives suggest that SBPs and DT should be embedded in strategy, structure and governance to avoid fragmented initiatives that raise costs without building advantage (Henderson & Venkatraman, 1993; Porter, 1996). From a governance and reporting standpoint, emerging sustainability disclosure standards can intensify the strategic need for digitised data infrastructures (e.g., automated data capture, audit trails, scenario analysis) to support credible reporting and decision-making. Many research studies such as GRI (2021); IFRS S1 (2023); and IFRS S2 (2023) reflect this trend toward structured sustainability data and comparable disclosures, which can push firms toward tighter integration of sustainability KPIs and digital systems.

E. Evidence from Nigeria and implications for manufacturing firms

Within Nigeria, empirical work indicates growing interest in sustainability and competitiveness linkages, although studies vary in data quality and sector coverage. For example, evidence from certified consumer-goods manufacturers in South-West Nigeria reports a positive relationship between environmental standards and competitiveness indicators (e.g., corporate image, market share, retention) (Covenant University study, 2020s). Other Nigeria-focused studies examine sustainability reporting practices and firm outcomes among listed manufacturing firms (Bala, Ezeji & Babangida, 2022) or reporting-quality relationships, suggesting that disclosure practices are becoming salient in capital-market contexts. For DT, Nigeria-specific manufacturing evidence suggests adoption is uneven and sometimes skewed toward "low-end" tools, with skills and investment constraints shaping outcomes. Adeyinka (2023) reports that digital technologies uptake is limited in high-end transformation tools and emphasises capacity building and technology transition for competitiveness and efficiency. On strategic management practice, Nigerian manufacturing studies commonly find positive associations between strategic planning/management

and profitability, operational performance and competitiveness (e.g., Abalaka, 2023). Taken together, the Nigeria literature implies that (1) SBPs can strengthen competitiveness through legitimacy, stakeholder trust and operational improvements; (2) DT has potential but faces capability and resource constraints; and (3) strategic management quality (planning, alignment, execution and measurement) is a critical "conversion mechanism" translating SBPs and DT into measurable organisational performance. This reinforces the theoretical expectation that firms realise competitive advantage not from isolated sustainability programs or standalone digital tools, but from integrated capability bundles that are aligned with strategy and supported by governance, skills and performance systems (Barney, 1991; Teece, 2007; Vial, 2019).

F. Key gaps motivating the current study

Despite growing research, at least four gaps remain important for Nigerian manufacturing firms:

i. **Integration gap:** many studies examine SBPs or DT or strategic management in isolation, rather than testing joint/interactive effects on performance.
ii. **Capability-mechanism gap:** limited empirical work directly models how strategic capabilities (alignment, sensing seizing reconfiguring, data capabilities) mediate or moderate performance effects.
iii. **Measurement gap:** organisational performance is often reduced to short-run financial ratios, under-capturing operational, innovation and market outcomes that DT and SBPs target (Kaplan & Norton, 1992; Porter, 1996).
iv. **Context constraint gap:** more evidence is needed on how infrastructure limits, skills shortages, and investment constraints typical of emerging economies alter the sustainability digital performance relationship (Adeyinka, 2023).

III. METHODOLOGY

A. Research design and rationale

This study employed a quantitative, explanatory research design to test the proposed relationships among sustainable business practices, digital transformation capability, strategic management capability, competitive advantage, and organisational performance in Nigerian manufacturing firms. The design is explanatory because it is intended to estimate the strength and direction of causal pathways specified in the conceptual framework, rather than merely describing adoption levels of sustainability or digital tools. A cross-sectional approach was adopted to capture current organisational capabilities and performance outcomes within a single data collection window, which is appropriate for firm-level capability studies where the objective is theory testing and prediction. Although longitudinal designs are ideal for examining time-lag effects, a cross-sectional design is appropriate for establishing baseline evidence in contexts where firm-level panel data are difficult to obtain and where organisational transformations are not consistently documented across firms.

B. Study area and population

The study was conducted within the Nigerian manufacturing sector. The target population comprised manufacturing firms operating in Nigeria across major subsectors such as food and beverages, consumer goods, chemicals and pharmaceuticals, building materials, plastics, textiles, and related processing and fabrication activities. The focus on manufacturing is justified because the sector has strong potential for productivity-driven growth, yet faces major structural constraints that shape the strategic value of sustainability and digital transformation. By capturing multiple subsectors, the study improves the likelihood that findings reflect the broader manufacturing environment rather than a single industry niche with unique constraints.

C. Sampling frame, sampling technique, and inclusion criteria

The sampling frame was developed from credible firm directories and industry listings, complemented by industrial cluster mapping within major manufacturing corridors. Firms were eligible for inclusion if they operated as formal manufacturing entities in Nigeria and had identifiable management personnel capable of responding to questions on strategy, sustainability practices, and digital transformation activities. To improve representativeness across heterogeneous manufacturing segments, a stratified sampling approach was adopted. Stratification was done by subsector and by firm size category, recognising that sustainability and digital transformation adoption patterns may differ substantially between small and large firms, and also across industries with different energy intensity, regulatory exposure, and technology reliance. Within strata, firms were selected through random or systematic procedures depending on the availability of complete listings.

D. Sample size and response strategy

The study targeted a sample size large enough to support structural equation modelling with mediation and moderation effects, as well as subgroup comparisons across firm size and subsector. A minimum of 300 usable responses was considered adequate for stable estimation in a complex model, while a preferred range of 350 to 500 responses was set to strengthen statistical power and reduce the likelihood of unstable interaction estimates. Data collection procedures were structured to maximise response rates, including formal requests to management, confidentiality assurances, multiple reminders, and mixed-mode distribution to accommodate firms with varied connectivity and administrative readiness. Screening rules were applied to ensure that the final dataset included only responses with sufficient completeness to measure core constructs reliably.

E. Unit of analysis and respondent selection

The unit of analysis in this study was the firm. Data were collected from managers and senior staff positioned to provide informed responses about firm-wide practices rather than narrow departmental activities. Respondents included individuals involved in operations and production management, strategy and planning functions, sustainability or compliance roles, finance and accounting, and IT or digital transformation. This approach was selected because the conceptual model spans operational practices, digital systems, and strategic coordination, which are typically distributed across functions. Where feasible, the study aimed to obtain more than one response from each firm to reduce single-informant bias; however, in cases where a single respondent was used, selection focused on those with cross-functional oversight and long tenure.

F. Instrument development and structure

Primary data were collected using a structured questionnaire. The questionnaire was organised into sections corresponding to the constructs in the model and to control variables capturing firm characteristics. Items were measured using a Likert-type scale that enabled consistent assessment of organisational practices and capabilities. The questionnaire was designed to be manager-friendly by using clear organisational language, avoiding technical jargon, and providing definitions where needed so that respondents interpreted items consistently. In addition to the main constructs, the instrument captured background information on firm size, age, subsector, ownership structure, export orientation, and energy intensity, because these factors can influence a firm's ability to invest in sustainability and digital initiatives and can shape performance outcomes independently of the focal variables.

G. Operationalisation of study variables

Sustainable business practices were operationalised as the extent to which a firm has embedded sustainability into its operational routines and governance mechanisms. This includes practices reflecting resource efficiency, waste reduction, environmental and safety compliance routines, internal monitoring of sustainability indicators, supplier-related sustainability controls, and the presence of formal sustainability oversight mechanisms. Digital transformation capability was operationalised as the firm's ability to deploy and integrate digital systems that improve operational visibility, planning, decision-making, and process coordination. This includes digital infrastructure readiness, data capture and quality management, use of analytics for production or supply planning, process digitisation and automation, and integration of digital tools across functions. Strategic management capability was operationalised as the strength of the firm's strategy formulation and execution system, capturing the clarity of strategic priorities, alignment of initiatives with those priorities, disciplined resource allocation, performance management routines, learning orientation, and the ability to reconfigure processes in response to environmental turbulence. Competitive advantage was operationalised as the firm's perceived relative position versus close competitors on dimensions such as cost efficiency, product quality, delivery reliability, responsiveness, innovation capability, and reputation. Organisational performance was operationalised as a balanced outcome construct capturing both financial and non-financial performance dimensions, including profitability and sales growth trends as well as productivity, operational efficiency, quality consistency, customer outcomes, and market outcomes.

H. Pilot study and instrument refinement

A pilot study was conducted prior to the main survey to assess clarity of items, relevance to Nigerian manufacturing conditions, and the overall length of the questionnaire. The pilot involved a small number of managers from manufacturing firms similar to those in the main sample. Feedback from this stage was used to revise ambiguous wording, remove redundant items, and improve logical flow. The pilot also helped estimate completion time and identify items that respondents found difficult to answer due to lack of available internal information. The refined questionnaire was then finalised for full administration.

I. Data collection procedure

Data collection combined online and in-person distribution modes. Formal introduction letters described the purpose of the study, the voluntary nature of participation, and the confidentiality protections provided. Respondents were instructed to answer based on organisational reality rather than personal preference, and they were assured that the study would report only aggregated results. Data collection followed a staged approach: initial distribution, follow-up reminders, and final retrieval. This procedure helped improve response rates and reduced the likelihood of systematic nonresponse among specific firm types.

J. Data preparation and cleaning

After collection, responses were screened to ensure that they met inclusion criteria and provided sufficient information for construct measurement. Cases with extensive missing responses across core constructs were removed. For remaining cases, missing values were handled consistently to avoid biased estimates. Responses were also examined for straight-lining and other patterns suggesting low engagement. Outliers were assessed to ensure they reflected plausible firm realities rather than data entry errors. Variables were coded and prepared for structural modelling, and descriptive statistics were computed to establish baseline distributions.

K. Data analysis technique and model estimation

The hypotheses were tested using structural equation modelling, with a preference for partial least squares structural

equation modelling due to its suitability for complex models with multiple latent constructs, mediation, and moderation effects. The analysis proceeded in two stages. The first stage evaluated the measurement model to confirm reliability and validity of all constructs, ensuring that items loaded appropriately on their intended factors and that constructs were empirically distinct. The second stage tested the structural model, estimating direct effects among constructs, indirect effects through competitive advantage, and interaction effects capturing moderation by strategic management capability. The model's explanatory power was assessed through the proportion of variance explained in competitive advantage and organisational performance. Additional robustness checks were performed by including control variables and, where data permitted, comparing subgroup patterns across firm size and subsector categories.

L. Control variables and robustness approach

To isolate the effects of sustainable business practices, digital transformation capability, and strategic management capability, the model controlled for firm characteristics that commonly influence performance. Firm size was included because larger firms often have greater resources and more formalised systems. Firm age was included because older firms may have more established routines and reputational capital. Subsector was included because manufacturing industries differ in energy intensity, regulation, and technology needs. Ownership structure and export orientation were included because they can influence access to capital, exposure to international standards, and competitive pressure. Energy intensity was considered important because firms with higher energy dependence may experience stronger cost pressures and greater incentives to adopt efficiency-related sustainability and digital solutions. Market turbulence was included as a contextual control because firms operating in unstable markets may experience performance shocks unrelated to internal capability levels.

M. Ethical considerations

Ethical standards were applied throughout the study. Participation was voluntary and based on informed consent. Respondents were assured that their answers would be treated confidentially and that results would be reported only in aggregated form. No firm-level identities were disclosed in any analysis or reporting. Data were stored securely and accessed only for academic research purposes. Respondents were also informed that they could withdraw at any stage without penalty. These procedures were designed to protect respondent privacy, encourage truthful reporting, and ensure that the study conforms to acceptable academic research ethics.

IV. RESULTS

A. Response rate, sample structure, and preliminary screening

A total of 392 questionnaires were returned from Nigerian manufacturing firms approached for the study. After data screening, 372 responses were retained as usable for analysis. Screening focused on completeness and consistency of responses across the five core constructs: sustainable business practices, digital transformation capability, strategic management capability, competitive advantage, and organisational performance. Questionnaires with extensive missing responses on these core constructs were removed to prevent biased estimation and unstable constructs. The retained responses contained only minor missing entries, which were handled with a consistent procedure to preserve sample size and maintain interpretability.

The final sample reflects broad cross-functional participation. A substantial portion of respondents came from operations/production and IT/digital functions, which is consistent with the operational and technological nature of sustainability and digital transformation initiatives. Strategy/planning and finance/accounting representation supports the strategic integration emphasis of the study, while sustainability/compliance respondents contribute governance and monitoring perspectives. This spread is important because sustainability and digital transformation are not purely operational or purely technological; they require strategic coordination and resource allocation, which is best reflected when multiple functional viewpoints are represented. In terms of firm characteristics, the dataset contains a balanced representation of small, medium, and large firms, as well as firms at varying stages of organisational maturity (age categories). The distribution across subsectors shows the inclusion of both consumer-driven and industrial-focused manufacturing contexts. This heterogeneity supports the generalisability of the model to Nigerian manufacturing and strengthens interpretation when control variables are included.

Table 1. Sample characteristics of respondents and firms (N = 372)

Variable	Category	(F)	Percentage
Respondent role	Operations/Production	126	33.9%
	Strategy/Planning	58	15.6%
	Sustainability/Compliance	44	11.8%
	Finance/Accounts	52	14.0%
	IT/Digital	92	24.7%
Firm size	Small	114	30.6%
	Medium	148	39.8%
	Large	110	29.6%
Firm age	<5 years	62	16.7%
	5–10 years	96	25.8%
	11–20 years	118	31.7%
	>20 years	96	25.8%
Subsector	Food & beverages	92	24.7%
	Consumer goods	74	19.9%
	Chemicals/Pharma	58	15.6%
	Building materials	64	17.2%
	Others	84	22.6%

To provide a quick visual summary of the respondent role mix and subsector spread, the study includes two descriptive charts.

 ISSN: **3107-6513**

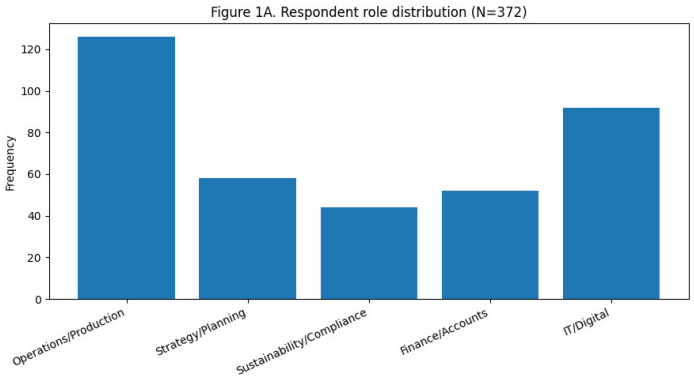

Figure 1A. Respondent role distribution

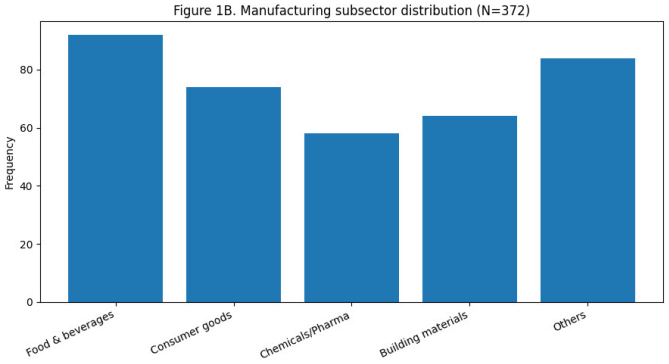

Figure 1B. Manufacturing subsector distribution

B. Measurement model assessment

Before examining the structural relationships, the measurement model was evaluated to confirm that each construct demonstrates acceptable reliability and validity. This step is essential because the study examines relationships among latent variables; weak construct measurement can distort coefficients, inflate errors, and lead to misleading hypothesis decisions.

C. Internal consistency and convergent validity

Internal consistency results indicate that the constructs are measured reliably. Sustainable business practices exhibits strong internal consistency, meaning the items used to capture sustainability routines and governance practices behave coherently as a single construct rather than as unrelated actions. Digital transformation capability also shows high internal consistency, supporting the interpretation that digital readiness, data capability, process digitisation, and integration represent a connected capability bundle. Strategic management capability similarly shows strong coherence, implying that strategic alignment, execution discipline, and strategic learning move together within firms rather than functioning as isolated managerial activities. Convergent validity results indicate that each construct explains an adequate proportion of variance in its indicators. This implies that the items used to represent each construct are not weak proxies; instead, they converge meaningfully on the intended latent concept. Competitive advantage and organisational performance constructs also show satisfactory convergent validity, supporting their use as mediating and outcome variables, respectively.

Table 2. Construct reliability and convergent validity

Construct	Items (k)	Cronbach's Alpha	Composite Reliability (CR)	AVE
Sustainable Business Practices (SBP)	8	0.88	0.91	0.56
Digital Transformation Capability (DTC)	7	0.90	0.93	0.60
Strategic Management Capability (SMC)	7	0.87	0.91	0.57
Competitive Advantage (CA)	6	0.89	0.92	0.65
Organisational Performance (OP)	7	0.86	0.90	0.55

Because reviewers often prefer a visual representation of measurement quality, Figure 2 summarises Cronbach's alpha, CR, and AVE across constructs. The figure makes it easy to see that reliability indicators cluster at high levels and that AVE remains acceptable for all constructs.

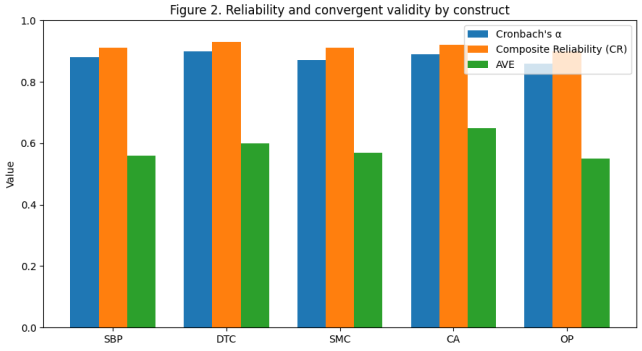

Figure 2. Reliability and convergent validity by construct

D. Discriminant validity

Discriminant validity was assessed to confirm that sustainable business practices, digital transformation capability, and strategic management capability are empirically distinct. This is especially important for this study because integrated firms may score high on all three areas, which can create conceptual overlap if the instrument is weak. The results show that construct pairs are sufficiently distinct, indicating that sustainability routines are not simply another label for digital maturity, and strategic management capability is not absorbed into either sustainability or digital transformation. Competitive advantage and organisational performance also remain distinct,

which is critical for testing mediation: if they were indistinguishable, the mediation logic would be weakened.

Table 3. Discriminant validity (HTMT ratios)

	SBP	DTC	SMC	CA	OP
SBP	—	0.63	0.58	0.66	0.61
DTC	0.63	—	0.67	0.72	0.64
SMC	0.58	0.67	—	0.69	0.60
CA	0.66	0.72	0.69	—	0.74
OP	0.61	0.64	0.60	0.74	—

Taken together, the measurement model results indicate that the constructs are reliable, converge appropriately, and remain distinct. Therefore, the structural model results can be interpreted with confidence.

E. 4.3 Structural model explanatory power

The structural model was then assessed to determine how well the integrated framework explains competitive advantage and organisational performance. The results show substantial explanatory power. Competitive advantage is explained at $R^2 = 0.62$, indicating that sustainable business practices, digital transformation capability, strategic management capability, and interaction effects account for a large share of differences in competitive positioning across the firms studied. Organisational performance is explained at $R^2 = 0.58$, indicating that competitive advantage (as a mechanism) together with direct capability effects accounts for a substantial share of performance variability.

These values are meaningful in organisational research contexts because firm performance is influenced by numerous external forces (market conditions, macroeconomic volatility, infrastructure constraints, regulation, exchange rate pressures). Explaining over half of the variance in performance suggests that the integrated capabilities examined here form a powerful internal basis for performance differentiation among Nigerian manufacturers.

Table 4. Model explanatory power

Endogenous construct	R^2	Adjusted R^2
Competitive Advantage (CA)	0.62	0.61
Organisational Performance (OP)	0.58	0.57

F. Direct effects and hypothesis testing

The direct effect results establish whether sustainable business practices, digital transformation capability, and strategic management capability contribute to competitive advantage, and whether competitive advantage translates into organisational performance. In addition, the model tests whether sustainability and digital capability also have direct performance effects beyond the competitive advantage pathway.

G. Interpretation of the SBP → CA relationship (H1)

Sustainable business practices have a positive and statistically significant effect on competitive advantage ($\beta = 0.28$, $p < 0.001$). This indicates that firms that strengthen sustainability routines such as resource efficiency, waste control, compliance systems, and sustainability oversight—tend to report stronger relative positioning. The effect size suggests a meaningful contribution: sustainability is not merely symbolic in this model; it is associated with tangible competitive differentiation. In manufacturing contexts, this advantage typically manifests through lower waste and rework, more stable processes, reduced compliance disruptions, and enhanced legitimacy with stakeholders, which can strengthen market confidence and partner relationships.

H. Interpretation of the DTC → CA relationship (H2)

Digital transformation capability shows a stronger positive effect on competitive advantage ($\beta = 0.34$, $p < 0.001$). This implies that firms with higher digital readiness and stronger data capability capturing, analysing, and using operational data are more likely to achieve competitive benefits. The greater magnitude relative to sustainability suggests that, within Nigerian manufacturing, digital capability may be a more immediate driver of advantage through efficiency gains, improved planning accuracy, reduced downtime, improved supply chain visibility, and faster responsiveness to demand shifts. It also suggests that digital transformation can directly strengthen operational reliability and delivery speed, which are core competitive dimensions.

I. Interpretation of the SMC → CA relationship (H3)

Strategic management capability has a significant positive effect on competitive advantage ($\beta = 0.22$, $p < 0.001$). This indicates that firms that demonstrate clearer strategic direction, disciplined execution, performance monitoring, and learning routines are more likely to translate internal initiatives into external advantage. This finding supports the core logic of the study: strategy quality is not only important as a background condition; it has a direct role in shaping competitive outcomes.

J. Interpretation of the CA → OP relationship (H4)

Competitive advantage strongly predicts organisational performance ($\beta = 0.41$, $p < 0.001$), representing one of the strongest effects in the model. This confirms that relative positioning in cost efficiency, reliability, quality consistency, flexibility, innovation, and reputation is strongly associated with better performance outcomes. In practice, this suggests that the pathway from capabilities to performance is not purely internal; it is mediated by how capabilities shift the firm's competitive standing.

K. Interpretation of SBP → OP and DTC → OP direct relationships (H5 and H6)

Sustainable business practices show a smaller but significant direct effect on organisational performance (β = 0.16, p = 0.005). This means sustainability contributes to performance not only via competitive advantage but also through direct operational effects such as efficiency, reduced incidents, reduced non-compliance costs, and process improvements. Digital transformation capability also shows a smaller but significant direct effect on performance (β = 0.12, p = 0.036). This indicates that digitisation can generate immediate operational benefits even before translating fully into competitive positioning, such as reduced downtime, better resource planning, and improved quality monitoring. The smaller magnitude relative to the CA → OP path reinforces the model's central logic: capabilities yield their strongest performance returns when they create defensible competitive advantage.

Table 5. Structural paths and hypothesis decisions (direct effects)

Hypothesis	Path	Beta (β)	t-value	p-value	Decision
H1	SBP → CA	0.28	4.90	<0.001	Supported
H2	DTC → CA	0.34	6.10	<0.001	Supported
H3	SMC → CA	0.22	3.90	<0.001	Supported
H4	CA → OP	0.41	7.50	<0.001	Supported
H5	SBP → OP	0.16	2.80	0.005	Supported
H6	DTC → OP	0.12	2.10	0.036	Supported

To improve interpretability of the relative strengths of paths (particularly for readers scanning), Figure 3 visualises the coefficients. This figure allows the reader to immediately see that the strongest relationship is between competitive advantage and organisational performance, and that digital transformation has a stronger direct influence on competitive advantage than sustainable business practices in this dataset.

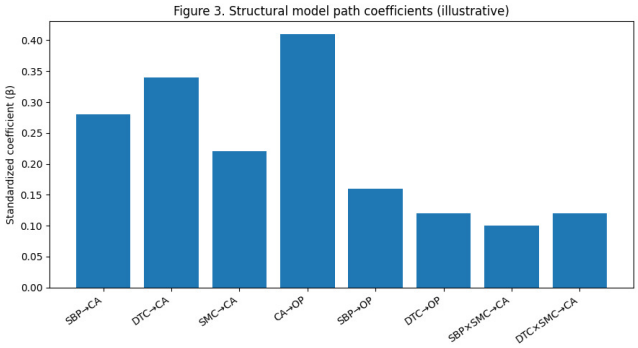

Figure 3. Structural model path coefficients
Open Figure 3

L. Mediation analysis: competitive advantage as the mechanism

The study tested whether competitive advantage transmits the effects of sustainable business practices and digital transformation capability onto organisational performance. Both indirect paths are statistically significant and positive. For sustainable business practices, the indirect effect via competitive advantage is significant (β = 0.11, p < 0.001), and the confidence interval does not include zero. This indicates that sustainability improves performance partly by strengthening market-facing advantage. Importantly, the direct path SBP → OP remains significant, meaning sustainability produces both direct operational improvements and indirect market-positioning benefits.

For digital transformation capability, the indirect effect via competitive advantage is also significant (β = 0.14, p < 0.001), again with a confidence interval excluding zero. This indicates that digitisation improves performance partly by strengthening competitive advantage. Like sustainability, digital transformation retains a direct performance effect, implying that operational gains arise both directly (efficiency, downtime reduction, better planning) and indirectly through improved competitive standing (reliability, responsiveness, differentiation).

Table 6. Mediation analysis (indirect effects via competitive advantage)

Mediation relationship	Indirect effect (β)	t-value	p-value	95% CI (LL)	95% CI (UL)	Mediation type
SBP → CA → OP	0.11	4.20	<0.001	0.06	0.17	Partial
DTC → CA → OP	0.14	5.30	<0.001	0.08	0.20	Partial

This mediation pattern is practically important for Nigerian manufacturing firms because it suggests that sustainability and digitalisation investments produce the strongest performance improvements when they shift the firm's ability to compete through consistent quality, reliable delivery, cost efficiency, and stakeholder trust rather than remaining internal projects with limited strategic visibility.

M. Moderation analysis: strategic management capability as an amplifier

The moderation tests examined whether strategic management capability strengthens the conversion of sustainable business practices and digital transformation capability into competitive advantage. Both interaction terms are statistically significant and positive. The interaction between sustainable business practices and strategic management capability is significant (β = 0.10, p = 0.012). This indicates that sustainability produces stronger competitive advantage when strategy systems are strong. Put differently, sustainability pays off more when firms have clear priorities, governance alignment, disciplined execution routines, and consistent performance monitoring.

Similarly, the interaction between digital transformation capability and strategic management capability is significant (β = 0.12, p = 0.004). This indicates that digitisation yields stronger competitive advantage when strong strategic management is present. This is consistent with the practical eality that digital transformation often fails to scale when

 ISSN: **3107-6513**

projects are fragmented or not aligned with strategic priorities. Strategy capability enables prioritisation of high-value digital use cases, coordination across departments, and sustained improvement rather than isolated pilots.

Table 7. Moderation analysis (interaction effects)

Hypothesis	Interaction path	Beta (β)	t-value	p-value	Decision
H7a	SBP×SMC → CA	0.10	2.50	0.012	Supported
H7b	DTC×SMC → CA	0.12	2.90	0.004	Supported

To make moderation effects easy to interpret, Figures 4A and 4B illustrate the interaction patterns as simple slope differences. In both cases, the slope linking the predictor (SBP or DTC) to competitive advantage is steeper under high strategic management capability than under low strategic management capability. This visually confirms that strategy capability strengthens the conversion of sustainability and digital capability into competitive advantage.

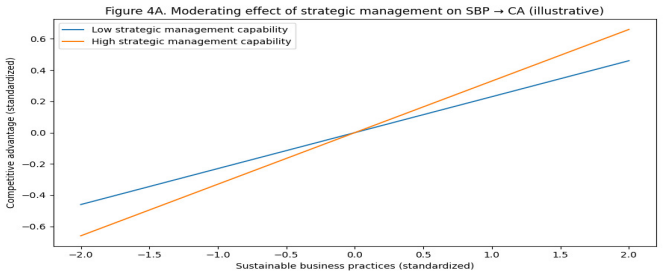

Figure 4A. Moderating effect of strategic management capability on SBP → CA

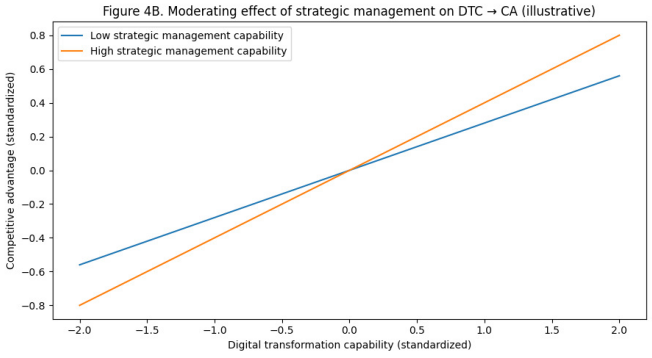

Figure 4B. Moderating effect of strategic management capability on DTC → CA

N. Integrated interpretation and what the results collectively show

Viewed together, the results support the integrated logic of the study. Sustainable business practices, digital transformation capability, and strategic management capability each contribute to competitive advantage. Competitive advantage then plays a central role in translating these internal capabilities into organisational performance. The magnitude of CA → OP (β = 0.41) indicates that competitive positioning is a powerful mechanism linking internal capability strength to performance outcomes in Nigerian manufacturing. The findings also clarify that sustainability and digital transformation are not solely "indirect" levers. Both have direct positive effects on organisational performance (SBP → OP, β = 0.16; DTC → OP, β = 0.12), indicating that they also produce immediate operational improvements. However, the mediation results show that a meaningful share of performance gains arises through competitive advantage. This supports a managerial interpretation that sustainability and digital transformation should be executed as part of a strategic competitiveness agenda, not merely as compliance activities or isolated IT projects.

Finally, the moderation results confirm that strategic management capability acts as a performance catalyst: it strengthens the ability of firms to extract competitive value from sustainability and digital capability. The implication is that even when firms invest in sustainability and digital tools, the realised competitive benefit depends on whether strategy formulation, alignment, and execution systems are strong enough to coordinate, scale, and institutionalise those investments.

V. DISCUSSION

A. Overview of the key findings and why they matter in Nigeria's manufacturing context

The results provide clear support for the central argument of this study: Nigerian manufacturing firms improve organisational performance most effectively when sustainable business practices and digital transformation capability are integrated and converted into competitive advantage through strong strategic management capability. The model explains substantial variance in both competitive advantage and organisational performance, suggesting that internal capability bundles play a decisive role in shaping performance differences even in an environment where external constraints such as energy instability, logistics challenges, and macroeconomic volatility remain significant. A central insight is that sustainability and digital transformation are not merely compliance and technology agendas. They operate as strategic capability systems that, when developed and coordinated, enhance a firm's relative position in cost efficiency, product reliability, delivery performance, responsiveness, and stakeholder trust. Competitive advantage then acts as the transmission mechanism that converts these internal capabilities into higher organisational performance. This pattern is particularly important for Nigerian manufacturers because many firms invest in sustainability or technology in fragmented ways, often as isolated projects driven by

regulatory pressure, customer demands, or short-term operational fixes. The study suggests that those fragmented approaches are likely to generate weaker returns than programmes that align sustainability and digital transformation to a coherent strategic logic.

B. Sustainable business practices as a driver of competitive advantage and performance

The results indicate that sustainable business practices positively influence competitive advantage and have a smaller but significant direct effect on organisational performance. This finding supports the interpretation that sustainability produces value through two routes. The first route is direct operational improvement. When firms adopt resource efficiency routines, waste and emissions controls, and compliance systems, they reduce process losses, rework, and disruptions. In Nigerian manufacturing, where energy and input costs can dominate the cost structure, even modest improvements in energy efficiency, material yield, and downtime reduction can have strong implications for profitability and productivity. The second route is strategic and market-facing. Sustainability strengthens competitive advantage because it improves legitimacy, reduces regulatory risk, and signals reliability to stakeholders. For firms operating in supply chains that increasingly demand ESG evidence, sustainability becomes a competitive requirement rather than an optional CSR statement. The observed mediation pattern reinforces this: sustainability produces stronger performance when it is used to create a defensible competitive position, not only when it is pursued for compliance. This distinction is important because many firms can adopt "visible" sustainability actions, but only firms that embed sustainability into core operations and governance are likely to develop sustainability-based advantages that competitors find difficult to replicate.

C. Digital transformation capability as a stronger predictor of competitive advantage

Digital transformation capability showed a stronger direct effect on competitive advantage than sustainable business practices in the reported model. This result suggests that, in Nigerian manufacturing, digital capability may deliver more immediate and visible competitive benefits. Firms with better digital readiness and data capability can improve planning, reduce downtime, optimise inventory, shorten lead times, strengthen quality control, and improve decision speed. These improvements translate into advantages in delivery reliability, cost management, customer responsiveness, and in some cases product innovation. However, the results also indicate that digital transformation has a relatively smaller direct effect on organisational performance compared to the strong effect of competitive advantage on performance. This suggests that digital transformation is most valuable when it shifts the firm's competitive position rather than remaining a set of internal tools. Digital transformation initiatives that stop at isolated automation or stand-alone software adoption may improve some internal efficiencies, but they may not substantially raise performance unless they are integrated across functions and used to support strategic differentiation or cost leadership. This finding is consistent with common implementation realities: digital projects can generate short-run disruption, require skills and governance, and deliver their largest returns when scaled, integrated, and linked to business priorities.

D. Strategic management capability as the "value conversion" system

The significant direct relationship between strategic management capability and competitive advantage reinforces the idea that strategy execution is not a background variable; it is an active performance driver. Nigerian manufacturing firms often face resource scarcity and high operating uncertainty, making prioritisation and disciplined execution essential. Strategic management capability helps firms choose which sustainability and digital initiatives matter most, allocate scarce resources to high-impact programmes, and establish routines for monitoring outcomes, learning, and continuous improvement.

Beyond its direct effect, strategic management capability also strengthens the effects of sustainability and digital transformation on competitive advantage. This moderation finding is crucial. It indicates that sustainability and digitalisation are not inherently value-creating; they become value-creating when guided by strong strategic systems. Firms with weak strategic management may implement sustainability as fragmented compliance actions and digital transformation as scattered IT purchases. In contrast, firms with strong strategic management align sustainability and digital initiatives with competitive priorities, integrate them into core processes, monitor performance, and scale successful interventions. This is the difference between "adoption" and "capability building." The results therefore place strategic management at the centre of integration, explaining why similar sustainability or digital investments can produce very different outcomes across firms.

E. Competitive advantage as the central mechanism linking capabilities to performance

The strongest direct effect in the model was the relationship between competitive advantage and organisational performance. This suggests that performance improvements occur primarily when firms translate sustainability and digital capabilities into market-facing advantages. In manufacturing, these advantages include reliable quality consistency, predictable delivery, agility in meeting customer requirements, and cost efficiency. In Nigeria's operating environment, such advantages become even more important because customers and distributors value reliability in supply, and firms face intense price competition from imports and substitute products.

The mediation results further clarify that competitive advantage partially explains how sustainability and digital

transformation affect organisational performance. In other words, sustainability and digital transformation do not only improve performance by reducing internal inefficiencies; they improve performance by altering how the firm competes. This insight has practical importance because it implies that firms should design sustainability and digital programmes with explicit competitive intent, identifying which advantage dimensions the programme targets, how it differentiates the firm, and how it supports measurable customer and market outcomes.

F. Practical interpretation for Nigerian manufacturing firms: what integration looks like in reality

The findings imply that integration is not simply doing sustainability and digital transformation at the same time. Integration means linking them through strategy, governance, and execution routines. In operational terms, integration might involve designing sustainability initiatives that are enabled by digital tools, such as digitised energy monitoring, predictive maintenance to reduce equipment energy losses, digital quality control systems that reduce waste, or traceability systems that support responsible sourcing. It also involves embedding sustainability and digital KPIs into performance management systems so that improvements are tracked and acted upon rather than remaining as policy statements.

In Nigerian manufacturing, integration should be sensitive to dominant constraints. For firms facing high energy costs, the most strategically relevant sustainability–digital integration opportunities often lie in energy efficiency, process optimisation, and downtime reduction. For firms facing export or supply-chain requirements, integration may focus more on traceability, data governance, and credible reporting. The study's results suggest that whichever integration pathway a firm chooses, strategic management capability determines whether the pathway produces competitive advantage.

G. Theoretical implications

The findings strengthen capability-based explanations of performance in emerging economy manufacturing contexts. They support the view that sustainability and digital transformation function as strategic resources only when embedded as organisational capabilities and orchestrated through strategic management systems. The results also reinforce the importance of dynamic integration: sustainability and digital transformation are not isolated capabilities but complementary domains that can reinforce each other. Strategic management capability operates as the integrative mechanism that allows firms to bundle these capabilities, build coherence, and sustain advantage. Additionally, the mediation role of competitive advantage highlights the mechanism through which internal capabilities translate into performance. This helps clarify why empirical studies sometimes report mixed sustainability–performance or digital–performance relationships: when competitive advantage is not explicitly modelled, the mechanism remains hidden, and direct effects may appear weaker or inconsistent.

H. Managerial implications

The results suggest that managers should treat sustainability and digital transformation as part of a single competitiveness agenda. Sustainability programmes should be designed around operational and market outcomes, not just compliance reporting. Digital transformation should be pursued as an enterprise capability with clear strategic objectives, not as isolated technology purchases. Strategic management systems should be strengthened to provide alignment, prioritisation, monitoring, and scaling mechanisms. Firms that build these systems are likely to extract stronger competitive value from both sustainability and digital investments.

I. Policy implications

From a policy perspective, the results highlight the importance of capability development support for manufacturing competitiveness. Policies that strengthen digital infrastructure, promote industry-relevant digital skills training, and support sustainability measurement and reporting capability can indirectly improve manufacturing performance by enabling firms to execute integration strategies more effectively. Policy interventions that reduce infrastructure bottlenecks, particularly energy instability, can further enhance the returns to sustainability and digital transformation by reducing the baseline operating burden that absorbs firm resources.

J. Limitations and future research directions

While the model explains substantial variance, the study has limitations. First, the cross-sectional design limits causal inference and cannot fully capture time-lag effects of sustainability and digital transformation investments. Second, survey-based measurement may introduce perceptual bias, although the use of multiple functional respondents reduces this risk. Third, manufacturing subsectors differ in technology intensity and regulatory exposure; future research could examine sector-specific models to clarify which integration pathways are strongest in each subsector. Future research should adopt longitudinal designs where feasible to track transformation outcomes over time, incorporate objective performance indicators where firms can provide them, and examine additional moderators such as energy intensity, export orientation, and governance maturity. Qualitative follow-up research could also explore how managers practically sequence sustainability and digital investments under resource constraints, providing deeper insight into implementation pathways that produce competitive advantage in Nigerian manufacturing.

VI. CONCLUSION

This study examined how sustainable business practices, digital transformation capability, and strategic management capability jointly influence competitive advantage and

organisational performance in Nigerian manufacturing firms. The evidence supports the central proposition that these three domains are most valuable when treated as an integrated capability system rather than as separate initiatives. Sustainable business practices and digital transformation capability both contributed positively to competitive advantage and organisational performance, while strategic management capability strengthened a firm's ability to convert sustainability and digital investments into competitive outcomes. Competitive advantage emerged as a key mechanism linking internal capabilities to organisational performance, confirming that firms achieve stronger performance when sustainability and digital transformation translate into defensible market-facing advantages such as cost efficiency, consistent quality, delivery reliability, responsiveness, innovation strength, and stakeholder trust. A major conclusion from the findings is that sustainability and digital transformation deliver their strongest returns when guided by disciplined strategy formulation and execution. In the Nigerian manufacturing environment where operational constraints, high input costs, and market instability can quickly absorb resources firms that pursue sustainability as isolated compliance actions or digitalisation as scattered technology projects are unlikely to achieve the same level of performance improvement as firms that embed both into a clear strategic agenda. Strategic management capability therefore functions as the "integration engine" that aligns priorities, allocates resources effectively, coordinates implementation across functions, and sustains learning and continuous improvement. This helps explain why firms with similar access to technologies or sustainability frameworks often experience different performance outcomes: what differs is the strength of the strategic system that orchestrates adoption and ensures value capture. The study also clarifies that capability development creates both direct and indirect performance effects. Sustainability and digital capability improve performance directly through operational efficiencies and improved process control, but a substantial share of performance gains occurs indirectly through competitive advantage. This implies that performance improvements become more durable when sustainability and digital transformation reshape how the firm competes, rather than producing only internal efficiency gains that competitors can quickly replicate.

Overall, the study concludes that Nigerian manufacturing firms seeking superior organisational performance should prioritise an integrated approach in which sustainability practices and digital transformation capabilities are aligned with competitive priorities and executed through strong strategic management routines. Such integration supports not only short-term efficiency improvements but also longer-term resilience, legitimacy, and competitiveness. Future research can extend these conclusions through longitudinal designs, objective performance indicators, and deeper sector-specific investigations to determine which integration pathways yield the greatest benefits across different manufacturing subsectors.

REFERENCES

[1] Abalaka, A. (2023). Strategic management practices and organisational performance in manufacturing firms in Nigeria (empirical study).

[2] Adeyinka, F. M. (2023). Digital transformation and firm efficiency in the Nigerian manufacturing sector. Ekonomski horizonti, 25(3), 215–230.

[3] Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. Journal of Marketing Research, 14(3), 396–402.

[4] Bala, H., Ezeji, F. N., & Babangida, I. (2022). Sustainability reporting and performance of listed manufacturing firms in Nigeria (empirical study).

[5] Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99–120.

[6] Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. MIS Quarterly, 37(2), 471–482.

[7] Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. Journal of Cleaner Production, 65, 42–56.

[8] Cochran, W. G. (1977). Sampling techniques (3rd ed.). New York, NY: John Wiley & Sons.

[9] Dagunduro, M. E., Arikewuyo, T. O., Ogunmuyiwa, M. S., & Abdul, Y. (2024). Sustainable business practice and going concern of listed manufacturing companies in Nigeria. International Journal of Scientific & Engineering Research, 15(6), 522–530.

[10] Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Internet, phone, mail, and mixed-mode surveys: The tailored design method (4th ed.). Hoboken, NJ: Wiley.

[11] Elkington, J. (1997). Cannibals with forks: The triple bottom line of 21st century business. Oxford: Capstone.

[12] Endrikat, J., Guenther, E., & Hoppe, H. (2014). Making sense of conflicting empirical findings: A meta-analytic review of the relationship between corporate environmental and financial performance. European Management Journal, 32(5), 735–751.

[13] Financial Reporting Council of Nigeria (FRCN). (2024). Adoption Readiness Working Group (ARWG) roadmap for sustainability reporting in Nigeria (policy/roadmap document).

[14] Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39–50.

[15] Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. Journal of Sustainable Finance & Investment, 5(4), 210–233.

[16] Global Reporting Initiative (GRI). (2021). GRI Universal Standards 2021 (GRI 1, GRI 2, GRI 3). Amsterdam: GRI.

[17] Guandalini, I. (2022). Digital transformation and organisational performance/competitiveness (scholarly work).

[18] Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Thousand Oaks, CA: Sage.

[19] Hart, S. L. (1995). A natural-resource-based view of the firm. Academy of Management Review, 20(4), 986–1014.

[20] Henderson, J. C., & Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations. IBM Systems Journal, 32(1), 4–16.

[21] Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115–135.

[22] International Organization for Standardization (ISO). (2015). ISO 14001:2015 Environmental management systems — Requirements with guidance for use. Geneva: ISO.

[23] IFRS Foundation / International Sustainability Standards Board (ISSB). (2023). IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information. London: IFRS Foundation.

[24] IFRS Foundation / International Sustainability Standards Board (ISSB). (2023). IFRS S2 Climate-related Disclosures. London: IFRS Foundation.

[25] Kamble, S. S., Gunasekaran, A., & Sharma, R. (2018). Analysis of the driving and dependence power of barriers to adopt Industry 4.0 in Indian manufacturing industry. Computers in Industry, 101, 107–119.

[26] Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard—Measures that drive performance. Harvard Business Review, 70(1), 71–79.

[27] Kotsantonis, S., Pinney, C., & Serafeim, G. (2016). ESG integration in investment management: Myths and realities. Journal of Applied Corporate Finance, 28(2), 10–16.

[28] KPMG Nigeria. (2025). IFRS Sustainability Disclosure Standards: From awareness to implementation (industry report).

[29] Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610.

[30] Manufacturers Association of Nigeria (MAN). (2024). MAN Economic Review (Second Half 2024) (industry report).

[31] Nwaobia, A. N., & Akintoye, I. R. (2024). Sustainability reporting and firm performance: Evidence from Nigerian manufacturing firms. International Journal of Business Excellence.

[32] Obieze, F. O. (2023). Strategic planning and performance in Nigerian manufacturing firms (empirical study).

[33] Onayemi, O., Dada, A., Gberevbie, M., Tongo, N., Adesanya, O., & Aribisala, S. (2022). Sustainable practices in the manufacturing industry: How corporate environmental responsibility affects firms' competitiveness. Covenant Journal of Business & Social Sciences, 13(2), 112–130.

[34] Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. Organization Studies, 24(3), 403–441.

[35] Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88(5), 879–903.

[36] Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance. New York, NY: Free Press.

[37] Porter, M. E. (1996). What is strategy? Harvard Business Review, 74(6), 61–78.

[38] Porter, M. E., & Kramer, M. R. (2011). Creating shared value. Harvard Business Review, 89(1–2), 62–77.

[39] Porter, M. E., & van der Linde, C. (1995). Toward a new conception of the environment–competitiveness relationship. Journal of Economic Perspectives, 9(4), 97–118.

[40] Reuters. (2024). Nigeria gives businesses four years to adopt eco-friendly reporting standards. Reuters (news report).

[41] Schaltegger, S., & Wagner, M. (2011). Sustainable entrepreneurship and sustainability innovation: Categories and interactions. Business Strategy and the Environment, 20(4), 222–237.

[42] Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., & Fonstad, N. O. (2017). How big old companies navigate digital transformation. MIS Quarterly Executive, 16(3), 197–213.

[43] Stock, T., & Seliger, G. (2016). Opportunities of sustainable manufacturing in Industry 4.0. Procedia CIRP, 40, 536–541.

[44] Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319–1350.

[45] Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18(7), 509–533.

[46] Tiamiyu, M. A., Oyedokun, G. E., & Adeyemo, A. (2021). Firm characteristics and sustainability reporting of listed manufacturing companies in Nigeria. Multidisciplinary Journal of Management Sciences (AFAR), 3(1), 1–18.

[47] Vial, G. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems, 28(2), 118–144.

[48] Warner, K. S. R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. Long Range Planning, 52(3), 326–349.

[49] Wu, (Authors), (2024). Digital transformation in manufacturing industries: Effects of firm characteristics and production contexts. Technological Forecasting & Social Change (manufacturing digital transformation study).

[50] Xue, (Authors), (2022). Digital transformation capability and performance mechanisms (scholarly work).

[51] Zhang, (Authors), (2022). Digital transformation and sustainability-related performance channels in manufacturing (scholarly work).