



## **LEVERAGING BIG DATA FOR PERSONALIZED MARKETING IN NIGERIA'S E-COMMERCE LANDSCAPE: OPPORTUNITIES AND CHALLENGES FOR SMES**

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**Abstract:** The rapid growth of e-commerce has intensified the need for data-driven marketing strategies, particularly among small and medium-sized enterprises (SMEs) operating in emerging economies. This study examines leveraging of big data adoption on marketing in Nigeria E-commerce landscape, Opportunities and challenges among Nigerian e-commerce SMEs, with a specific focus on customer acquisition effectiveness. Drawing on the Technology Organization Environment (TOE) framework, the study conceptualizes big data adoption across key dimensions, including data collection capability, analytical and interpretive skills, and technological infrastructure readiness. A quantitative research approach was employed, using survey data collected from owners, managers, and marketing personnel of Nigerian e-commerce SMEs. Data were analyzed using appropriate statistical techniques to assess the relationship between big data adoption and marketing outcomes. The findings reveal that big data adoption has a positive but uneven influence on marketing performance. While firms with stronger data collection and analytical capabilities experience improved customer targeting, personalization, and acquisition effectiveness, many SMEs fail to realize significant benefits due to infrastructural limitations, inadequate technical skills, and resource constraints. This study contributes to the literature by providing context specific empirical evidence from Nigeria, a setting that remains underrepresented in big data and e-commerce research. Practically, the findings highlight the need for SMEs to invest not only in data technologies but also in human capital development and organizational readiness

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**Keywords:** Big data, analytic, customer acquisition, opportunity, Challenges, SMEs

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### **INTRODUCTION**

Data can be a company's most valuable asset. Data is information, often in the form of facts or figures, that can be analyzed to gain insights or support decision-making. It can be raw and unorganized, or it can be processed and

presented in a meaningful way. Leveraging data involves the strategic use of data in order to improve business and gain a competitive advantage. It involves analyzing data from a variety of sources to measure performance and process, set strategic goals, and guide improvement.

**Business Management and Entrepreneurship Academic Journal**

**An official Publication of Center for International Research Development**

Double Blind Peer and Editorial Review International Referred Journal; Globally index

Available <https://cirdjournals.com/index.php/bmeaj>; E-mail: [journals@cirdjournals.com](mailto:journals@cirdjournals.com)



Effectively leveraging data not only involves collecting and analyzing data points, it also requires companies to act on the insights from that data.

Recent studies highlight the potential of big data and artificial intelligence in enhancing marketing performance for content can significantly improve marketing strategies and customer insights for e-commerce platforms (Onobrakpeya & Bayagbon, 2024). Big data analytics enables better decision making. Leveraging predictive analytics and personalizing and knowledge extraction in e-commerce through machine learning models applied to large datasets (Zineb et al., 2021). Although it may appear that Big Data is mostly employed in scientific fields, in the business world it must also be very present when important decisions are made. In the marketing area, it has become a fundamental piece to carry out large-scale campaigns. Big data is now influencing important marketing decisions. This refers to the application and study of complex, large data sets that cannot be processed by traditional data processing applications.

The term Big Data Marketing emerged as a solution to the needs that marketing has posed since its inception on aspects such as market and consumer analysis (Ortiz Morales et al., 2016). This concept refers to the processes, tools, techniques, and technology used to process large amounts of data in real time, allowing us to analyze consumer behavior.

## RESEARCH HYPOTHESES

**H<sub>01</sub>:** There is no significant difference in marketing outcomes between Nigerian e-commerce businesses that use big data in decision-making.

**H<sub>02</sub>:** There are no significant barriers affecting the adoption of big data for marketing in Nigerian SME e-commerce businesses.

## CONCEPTUAL REVIEW

### Big Data Adoption in Marketing

Big data adoption in marketing is the integration and utilization of massive datasets, collected from diverse sources like digital platforms and customer interactions, to extract actionable insights and drive informed marketing decisions, enabling personalized customer experiences,

targeted advertising, and improved overall marketing performance. This adoption allows marketers to move beyond assumptions, identifying trends and patterns to better understand customer behavior, preferences, and market dynamics for more effective strategic planning. Big data adoption in marketing refers to the strategic use of large-scale, diverse, and rapidly generated datasets to inform, optimize, and personalize marketing decisions (Gandomi & Haider, 2015). It refers to the strategic integration of large, complex datasets into the decision-making processes of businesses to improve marketing performance (Chen et al., 2012). In e-commerce, big data comes from various sources such as website click streams, purchase histories, customer reviews, and social media interactions. The capacity to capture, process, and analyze this data enables more precise targeting, predictive modeling, and campaign optimization.

For Nigerian e-commerce SMEs, big data adoption involves the collection, storage, processing, and analysis of data from multiple sources such as online transactions, customer reviews, social media interactions, clickstream data, and mobile app usage (Gandomi & Haider, 2015). This adoption enables businesses to predict customer behavior, tailor marketing campaigns, and make informed decisions that improve operational and strategic outcomes. In the Nigerian e-commerce context, adoption is influenced by firm size, available resources, managerial mindset, and technological readiness (Eze et al., 2019). The adoption of big data in marketing is generally assessed along three main dimensions: data collection capability, data analysis and interpretation skills, and technology infrastructure readiness. These dimensions represent the core elements that determine how effectively a firm can leverage big data for marketing purposes.

These dimensions collectively determine the extent to which Nigerian e-commerce SMEs can leverage big data to improve marketing outcomes such as customer acquisition, retention, and revenue growth. Firms that underperform in any of these dimensions are likely to experience limited benefits from big data adoption, supporting the study's null hypothesis that big data adoption may not significantly differentiate marketing outcomes when barriers persist.



### **Data Collection Capability**

Data collection capability is the first critical component of big data adoption. It refers to the firm's ability to gather accurate, relevant, and high-volume data from various digital and traditional sources (*LaValle et al., 2011*). Big Data Capabilities refer to the organizational ability to effectively capture, analyze, and leverage large volumes of diverse data to generate insights and drive business value. This capability is built on the firm's capacity to orchestrate its data, technology, and talent through well-defined processes, roles, and structures (*Horng et al., 2022*). Big data capabilities involve the capacity to deploy advanced technologies such as parallel computing, machine learning, and predictive analytics to handle the high volume, velocity, and variety of data (*Singh & El-Kassar, 2019*). Data collection capabilities are crucial for firms to innovate and compete in today's data-driven environment. By harnessing big data, organizations can uncover trends, patterns, and customer behaviors, which inform strategic decisions and enhance operational efficiency (*Rialti et al., 2019*). The core of big data capabilities involves managing the "Vs" of big data: volume, variety, velocity, veracity, and value to extract actionable insights from complex datasets (*Dharmawan et al., 2023*). Modern e-commerce platforms often collect transactional, demographic, and behavioral data that, if structured and cleaned properly, can form the foundation for analytics. Weak infrastructure and low automation levels in Nigerian SMEs often limit this capacity (*Adeleke & Sanni, 2020*). Data collection in Nigeria faces barriers including inadequate funding, a shortage of skilled personnel, poor and outdated infrastructure and software, a lack of standardized data management systems, and the prevalent issue of political corruption and instability.

In Nigeria, SMEs often face challenges in developing robust data collection systems due to limited technological infrastructure, low digital literacy, and inconsistent internet access (*Eze et al., 2019*). Many SMEs rely on manual or semi-automated methods, which restrict the volume and accuracy of data collected (*Adeleke & Sanni, 2020*). The inability to collect sufficient and reliable data impedes their capacity to derive meaningful insights, making this

dimension a critical determinant of successful big data adoption. Furthermore, the richness and variety of data play a crucial role. Multi-source data that includes both structured (e.g., transaction logs) and unstructured data (e.g., social media posts) enhances analytical outcomes by providing a holistic understanding of consumer behavior (*Chen, Chiang, & Storey, 2012*). The lack of integration across data sources in many Nigerian SMEs further limits the effectiveness of marketing analytics.

### **Marketing Outcomes**

Marketing outcomes are the measurable, desirable business results, marketing strategy aims to achieve, focusing on tangible impacts like increased sales, brand awareness, customer retention, and revenue growth rather than just activities or "outputs" like blog posts or ad clicks. Big data adoption in marketing leads to outcomes like personalized marketing campaigns, deeper customer understanding, data driven decision making and increased return on investment through better resource allocation. Businesses can tailor messages and experiences for different customer segments, identify emerging trends for proactive strategic adjustments, and optimize campaign performance for higher engagement and conversion rates. This data driven approach ultimately enhances the overall customer experience and builds greater loyalty and trust.

In big data-driven marketing, these outcomes are often linked to increased targeting accuracy, improved customer retention, and higher return on investment (ROI) (*Wamba et al., 2017*). For Nigerian e-commerce, outcomes can be evaluated in terms of customer acquisition, retention, and revenue growth. Marketing outcomes in Nigerian e-commerce SMEs can be significantly influenced by the adoption of big data analytics. The dimensions of customer acquisition effectiveness, customer retention and loyalty, and sales and revenue growth are all positively impacted by the strategic use of big data. However, the extent of these benefits is contingent upon overcoming challenges related to data collection capabilities, analytical skills, and technological infrastructure readiness

### **Customer Acquisition Effectiveness**

Customer acquisition is the process of identifying,



attracting and retaining potentially profitable customers (Suphan, N., 2015). Customer Acquisition is the process of gaining new customers for a business. It involves various marketing and sales activities generating leads and converting them into paying customers. The goal is to build a strong customer base and expand market reach. Customer acquisition effectiveness refers to how well a company attracts new customers and converts them into paying clients through its marketing and sales strategies. It's a vital measure of business health, calculated by dividing the total acquisition costs by the number of new customers gained to determine the customer acquisition cost (CAC), and is improved by understanding the target audience, crafting compelling messages, implementing multichannel marketing, personalizing customer experiences, and leveraging data analytics for continuous optimization. It measures the efficiency with which new customers are attracted through marketing campaigns. Customer acquisition effectiveness pertains to the ability of a business to attract new customers through marketing efforts. Big data can improve acquisition by enabling more precise targeting, personalized offers, and optimized ad placements (Chen et al., 2012). However, the adoption of big data analytics for customer acquisition in Nigerian SMEs is often hindered by challenges such as limited data collection capabilities and inadequate analytical skills. Recent studies have highlighted the positive impact of digital marketing strategies on customer acquisition. For instance, a study by Sharabati et al. (2024) found that SMEs employing digital marketing strategies, including online advertising and social media marketing, experienced increased customer engagement and acquisition. Similarly, research by Anshari et al. (2019) emphasized the role of big data in supporting personalized marketing efforts, leading to more effective customer acquisition strategies.

### Theoretical Review

#### Technology Organization Environment (TOE) Framework

The Technology-Organization-Environment (TOE) framework, developed by Tornatzky and Fleischer (1990), is one of the most influential models in understanding how

organizations adopt technological innovations. The framework posits that adoption and effective utilization of new technologies are influenced by three interdependent dimensions: technological, organizational, and environmental. This framework has been widely applied in studies on digital transformation, cloud computing, artificial intelligence, and big data adoption across different industries (Baker, et al., 2020). In Nigerian e-commerce SMEs, the TOE framework provides a structured lens to identify both the drivers and barriers of adoption, aligning directly with the hypotheses guiding this study. The technological dimension refers to the availability, characteristics, and suitability of a given technology for adoption. It includes factors such as relative advantage, complexity, compatibility, and observability of the technology (Oliveira et al., 2019). : Big data analytics (BDA) offers the ability to generate personalized marketing, optimize pricing, and predict consumer demand, advantages that traditional marketing cannot provide (George et al., 2021). Complexity: SMEs often lack the technical know-how to analyze unstructured data, leading to challenges in adoption (Kamalahmadi et al., 2021). Compatibility: The success of BDA depends on integration with existing e-commerce platforms, CRM systems, and payment infrastructures (Sivarajah et al., 2017). In Nigeria, poor data collection methods, low digital literacy among consumers, and fragmented digital infrastructure limit the effectiveness of big data solutions (Afolayan & Okoro, 2020). The technological dimension directly links to hypothesis as complexity and infrastructural challenges are among the barriers SMEs face in adopting big data.. Nigeria's e-commerce industry presents a highly dynamic and challenging environment for technology adoption. Many firms operate in an ecosystem characterized by infrastructural deficits like., unstable electricity supply, poor broadband penetration, organizational weaknesses, shortage of skilled data scientists, and environmental uncertainties (e.g., regulatory ambiguity, cybercrime). The TOE framework directly addresses these realities by examining adoption as a contextual process shaped by internal and external conditions (Awa et al., 2017).

For example, an SME with limited capital and managerial



expertise may be unable to adopt big data analytics tools despite recognizing their potential benefits. Similarly, firms with high readiness but operating in unstable regulatory or competitive environments may struggle to leverage big data effectively. TOE not only helps explain differences in marketing outcomes between adopters and non-adopters but also uncovers the structural and systemic barriers that hinder adoption. This dual explanatory power makes TOE the most suitable theory for this study. This study adopts the TOE framework as its guiding theoretical lens because it provides the most comprehensive explanation of the factors shaping big data adoption and its marketing outcomes in Nigeria's e-commerce sector. While RBV contributes insights on the strategic value of big data as a resource, and DOI highlights the role of perceived innovation attributes, TOE integrates these perspectives within a contextual framework that directly addresses the research hypotheses. By grounding the study in TOE, the research can more effectively explore how Nigerian commerce firms leverage big data, the barriers they face, and the implications for marketing performance in a fast-evolving digital economy

### **EMPIRICAL REVIEW**

Akter, Wamba, Gunasekaran, Dubey, and Childe (2017) and Mikalef, Pappas, Krogstie, and Giannakos (2020) commonly collect data at a single point in time through surveys administered to managers, IT staff, or marketing professionals. While these approaches provide useful insights of perceptions and adoption levels, they fail to capture the dynamic and evolving nature of big data integration in e-commerce marketing. The adoption of big data is not a static process but one that unfolds over time, influenced by technological upgrades, organizational learning, and environmental shocks such as regulatory changes or market competition (Chen, et al., 2021). Therefore, the reliance on cross-sectional surveys weakens the ability of existing studies to establish causal relationships between big data adoption and marketing outcomes. Another major critique lies in the geographic concentration of empirical studies. Much of the evidence on big data adoption and its impact on marketing performance has emerged from developed economies in

North America, Europe, and parts of Asia (Mikalef et al., 2020). While these contexts provide important insights, they differ significantly from developing economies such as Nigeria, where e-commerce growth is constrained by infrastructural deficiencies, unreliable internet penetration, and limited consumer trust in online transactions (Okafor & Osei-Bryson, 2021, Sodeinde, 2025). Consequently, findings from Western contexts may not be directly generalizable to Nigeria. This underrepresentation of African and particularly Nigerian SMEs in big data literature constitutes a serious methodological gap that this study intends to address. A further methodological limitation is the heavy reliance on self-reported measures of performance. Many studies assess marketing outcomes through managers' perceptions of customer satisfaction, sales growth, or competitive advantage (Wamba et al., 2017). While perceptions provide valuable insights, they are susceptible to bias, exaggeration, or under reporting, especially when managers seek to portray their organizations in a favorable light. The lack of triangulation with objective measures such as website analytics, customer churn rates, or financial records reduces the reliability and validity of findings. Recent research suggests that integrating big data performance metrics with perceptual survey data could enhance methodological robustness (Mikalef et al., 2021). Additionally, there is limited methodological innovation in the tools and techniques employed in analyzing big data adoption. Most empirical works use regression models or structural equation modeling (SEM) to test hypotheses about adoption factors and outcomes (Childe et al., 2017). Moreover, sampling strategies in prior studies often suffer from bias. Large organizations are disproportionately represented, as they are more visible and accessible to researchers, while small and medium-sized e-commerce enterprises reflect the experiences of resource-rich enterprises rather than SMEs, which typically struggle with cost, expertise, and infrastructural barriers to big data adoption. Since SMEs are central to Nigeria's e-commerce landscape, the methodological neglect of this category of firms raises questions about the representativeness and external validity of existing research. Finally, another methodological weakness is the limited contextualization



of research instruments. Many studies adopt pre-validated survey instruments developed in Western contexts (Oliveira *et al.*, 2019). While these instruments are statistically reliable, they may not fully capture the unique socio-cultural and infrastructural realities of Nigerian e-commerce businesses. For example, factors such as electricity reliability, cyber security risks, or digital payment adoption are critical issues in Nigeria and are often excluded from standardized instruments. Without localization of measurement tools, empirical findings risk being incomplete or misaligned with the practical challenges of Nigerian firms. Existing empirical studies are limited by their over reliance on cross-sectional designs, geographic concentration in developed economies, dependence on self-reported measures, lack of methodological innovation, biased sampling toward large enterprises, and insufficient contextualization of research instruments. These limitations underscore the need for context-specific, longitudinal, and methodologically innovative studies tailored to Nigeria's e-commerce ecosystem. A critical observation across existing studies is the inconsistent evidence regarding the impact of big data adoption on marketing outcomes. While several scholars report positive associations between big data use and improved marketing performance, such as customer segmentation, personalization, and sales growth (Akter *et al.*, 2017), other studies reveal more modest or mixed effects (Chen, *et al.*, 2021). These inconsistencies may stem from variations in the level of organizational readiness, data quality, and analytics capabilities across firms. For instance, businesses with inadequate data literacy or poor IT infrastructure often fail to realize the expected benefits of big data adoption, leading to contradictory findings in the literature (Wamba *et al.*, 2017). This lack of consensus raises doubts about the universality of claims that big data adoption automatically translates to superior marketing outcomes. Another critique relates to the limited exploration of contextual barriers and their influence on findings. In developed economies, findings often highlight big data as a driver of strategic advantage, assuming the presence of enabling infrastructure and skilled personnel (Gupta & George, 2017). However, such findings are less applicable to

developing economies like Nigeria, where systemic barriers such as high costs of data infrastructure, limited access to skilled professionals, and unreliable internet penetration directly constrain adoption outcomes (Okafor & Osei-Bryson, 2021). The relative neglect of these barriers in empirical reporting creates a gap in understanding the conditions under which big data is beneficial or detrimental for SMEs in resource-constrained environments. Additionally, many findings overemphasize the technological dimension of big data adoption while underplaying organizational and environmental factors. For example, several studies focus on the capabilities of analytics tools, data storage systems, and platforms (Dremel *et al.*, 2020), but devote less attention to the role of leadership commitment, organizational culture, or regulatory frameworks. This creates a skewed representation of reality, since research has shown that non-technological factors often make the difference between successful and failed adoption (Oliveira *et al.*, 2019). Findings that disproportionately stress technology risk misleading practitioners into believing that investing in tools alone guarantees success, ignoring the softer aspects of change management and skill development. Another major issue is the over generalization of findings across firm sizes and industries. Much of the empirical evidence comes from large multinational firms with substantial resources to invest in big data infrastructure (Gunasekaran *et al.*, 2017). Consequently, findings from these contexts suggest significant performance gains. However, such results may not hold true for small and medium-sized enterprises (SMEs) in Nigeria, which typically face resource constraints and may not achieve the same scale of benefits (Kouhizadeh, *et al.*, 2019). The uncritical transfer of results from large firms to SMEs risks creating misleading assumptions about the potential of big data in smaller e-commerce firms.

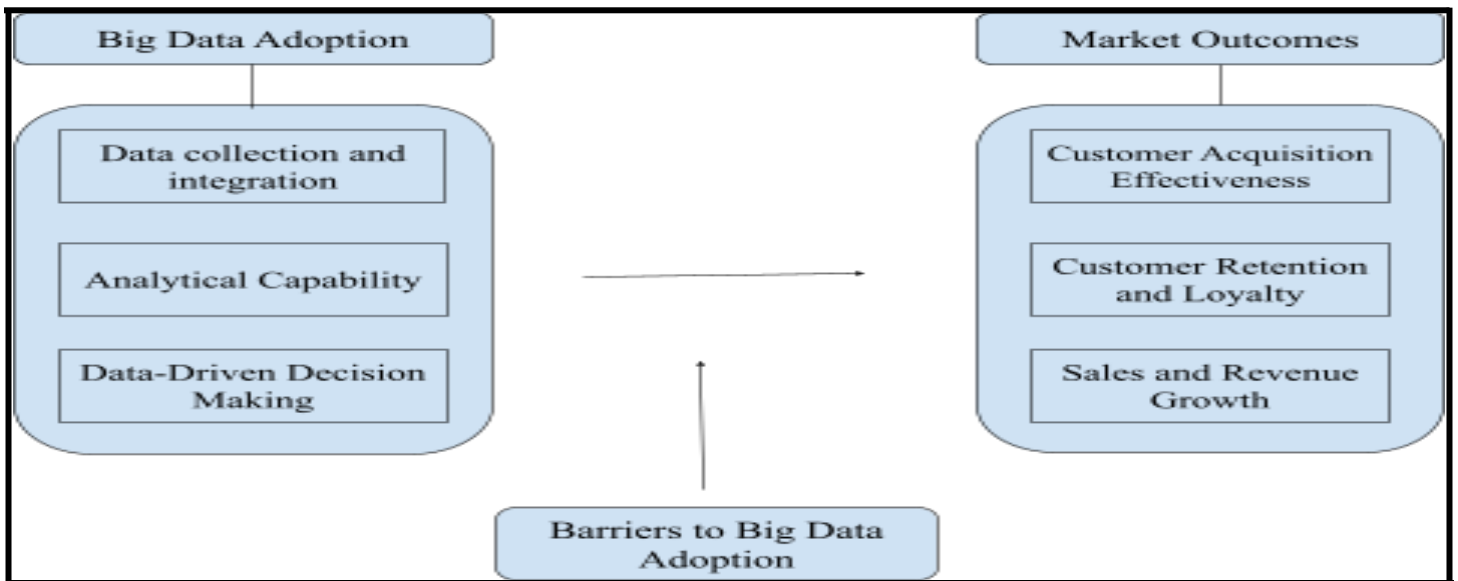
Furthermore, a recurring limitation in the findings is the failure to capture long-term impacts of big data adoption. Most studies focus on immediate or short-term outcomes such as customer engagement, operational efficiency, or sales performance (Akter *et al.*, 2017). Yet, big data integration often yields strategic benefits such as market expansion, innovation, and sustainable competitive



advantage only over the long term (Mikalef et al., 2020). The absence of longitudinal evidence in findings means that claims about big data's transformative potential remain speculative rather than empirically grounded. Without long-term validation, it is difficult to determine whether big data adoption sustains competitive advantage or whether the observed benefits diminish over time..Several studies acknowledge cost, infrastructure, and data literacy as barriers (Okafor & Osei-Bryson, 2021), but often treat them as uniform challenges across contexts. In reality, these barriers differ in scale and significance depending on firm size, sector, and local market conditions. While high infrastructure costs may be the dominant barrier for Nigerian SMEs, regulatory issues or consumer data privacy concerns may be more pressing in

developed economies (Chen et al., 2021). The lack of nuanced reporting results in findings that may not fully reflect the complex realities businesses face in diverse conditions..Finally, the causal mechanisms underlying findings are often under explored..Studies frequently report correlations between big data adoption and positive outcomes, they rarely explain *how* or *why* these outcomes emerge. For instance, findings may indicate that big data adoption improves customer satisfaction but fail to specify whether this results from improved personalization, faster response times, or predictive analytics (Mikalef et al., 2021). Without unpacking these mechanisms, findings remain descriptive and offer limited practical guidance for e-commerce businesses seeking to optimize their big data strategies.

**Conceptual Framework Diagram**

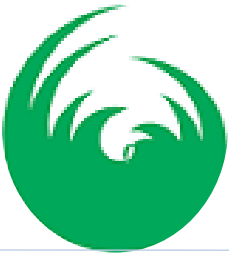


Author's Computation , 2025

**Methodology**

This study employed a descriptive survey research design combined with a correlational design examine the Leveraging Big Data for Personalized Marketing in Nigeria's E-commerce Landscape: Opportunities and Challenges for SMEs The population of the study

comprised e-commerce SMEs operating in Nigeria, including both large-scale enterprises and small and medium-sized enterprises (SMEs) involved in online sales. An estimated population of 1,200 SMEs selected firms was assumed. Using Yamane's (1967) sample size determination formula with a 5% margin of error, a sample



size of 300 respondents was determined Primary data were collected through a structured questionnaire administered electronically via Google Forms to ensure wide coverage and convenience for respondents across different locations in Nigeria.. Responses to the study variables were measured using a five-point Likert scale. The collected data were analyzed using quantitative methods, including descriptive and inferential statistics. Correlation analysis was used to determine the relationship between big data adoption and marketing outcomes, and the findings were

interpreted to draw valid conclusions for the study

**Descriptive Analysis of Key Variables**

Descriptive analysis of key variables summarizes the central tendency and dispersion of the study’s constructs: Data Collection Capability (DC), Data Analysis Capability (DA), Data-Driven Decision Making (DD), Barriers to Adoption (BAR), and Marketing Outcomes (MO).

*Descriptive Statistics of Study Variables (N = 300)*

**Table 1**

Variable	Mean	Standard (SD)	Deviation	Interpretation
Data Collection Capability (DC)	4.11	0.61		High
Data Analysis Capability (DA)	3.94	0.68		High
Data-Driven Decision Making (DD)	4.06	0.59		High
Barriers to Adoption (BAR)	2.87	0.77		Moderate
Marketing Outcomes (MO)	4.02	0.63		High

Author’s Computation , 2025

The high mean values across data-related capabilities and marketing outcomes confirm that big data utilization is increasingly integrated in marketing strategy among Nigerian e-commerce firms. However, the slightly

moderate perception of barriers suggests that institutional and infrastructural challenges continue to inhibit full exploitation of big data’s potential.

**Correlation Matrix**



**Table 2**

Variables	DC	DA	DD	BAR	MO
Data Collection Capability (DC)	1				
Data Analysis Capability (DA)	.714**	1			
Data-Driven Decision Making (DD)	.687**	.756**	1		
Barriers to Adoption (BAR)	-.421**	-.398**	-.362**	1	
Marketing Outcomes (MO)	.703**	.721**	.684**	-.512**	1

Author's Compuation , 2025

Note: \*\*p < 0.01 (2-tailed)\*\*.

The correlation analysis explores the strength and direction of the relationships among the key variables. Strong positive correlations were observed among the big data capability dimensions themselves. These findings indicate that data collection, data analysis, and data-driven decisions are interdependent processes. SMEs Firms that efficiently collect quality data are also more likely to possess strong analytical capacities and make informed, data-backed marketing decisions.

The correlations between data-related capabilities and marketing outcomes are consistently positive and significant. This shows that firms with higher levels of data collection, data analysis, and data-driven decision-making tend to experience stronger marketing performance outcomes such as customer retention, sales growth, and customer effectiveness.

The Barriers to Adoption (BAR) variable exhibits significant negative correlations with all big data capability



dimensions and marketing outcomes. This implies that firms encountering greater cost, technical, infrastructural, or data-literacy barriers tend to display weaker data adoption and consequently lower marketing performance. The strongest negative effect occurs between barriers and Marketing Outcomes, signifying that obstacles such as insufficient analytics skills or limited access to digital infrastructure can substantially undermine marketing effectiveness (Eze & Chinedu, 2021; Adeleke & Adesina, 2022)

### TEST OF RESEARCH HYPOTHESES

The hypotheses were tested using the correlation.. The level of significance for all tests was set at 0.05 (5%). Hypothesis One ( $H_{01}$ ): There is no significant difference in marketing outcomes between Nigerian e-commerce businesses that use big data in decision-making and those that rely on intuition or traditional methods

Decision Rule: Reject  $H_0$  if  $p < 0.05$ ; otherwise, fail to reject. Test and Result:

The results imply that firms that employ big data analytics achieve significantly better marketing outcomes compared to those that rely on intuition or traditional marketing approaches.

Therefore, the null hypothesis ( $H_{01}$ ) is rejected, and the alternative hypothesis is accepted. This finding aligns with the works of Akter et al. (2021) and Wamba et al. (2020), who reported that data-driven decision-making enhances marketing effectiveness, customer engagement, and return on investment (ROI).

Hypothesis Two ( $H_{02}$ ):

There are no significant barriers affecting the adoption of big data for marketing in Nigerian SMEs e-commerce businesses.

Decision Rule: Reject  $H_0$  if  $p < 0.05$ ; otherwise, fail to reject. Test and Result:

The results imply that adoption of big data significantly better marketing in Nigeria SMEs. Therefore, null hypothesis is  $H_0$  is rejected and alternative hypothesis is accepted .The findings indicate that barriers such as high cost of data technology, lack of skilled personnel, poor data infrastructure and ethical and privacy concerns, significantly hinder big data adoption among Nigerian

SMEs. Consequently, the null hypothesis ( $H_{02}$ ) is rejected, confirming that barriers do significantly affect big data marketing adoption. This outcome is consistent with prior studies (e.g., Ahmed & Wamba, 2020; Gupta & George, 2016) which highlighted that organizational readiness, resource limitations, and technological complexity are major constraints to effective big data implementation in emerging markets.

### SUMMARY OF FINDINGS

This study examined the role of big data analytics in enhancing data-driven marketing within Nigeria's e-commerce sector. The research aimed to determine how big data adoption influences marketing outcomes, identify barriers to its adoption, and evaluate the extent to which data-driven decision-making improves marketing performance. The study achieved a valid sample of 300 respondents, yielding a 93.8% response rate. The respondents represented various functional roles such as business owners/ CEOs/ MD, marketing managers, data analysts, and IT/technical staff across different categories of Nigerian e-commerce firms such online marketplaces, brand retailers with online stores, and social commerce sellers.

The descriptive analysis revealed that most respondents were either owners/CEOs/MD (34.7%) or marketing managers (22%), indicating active participation of key decision-makers. Most firms were SMEs (64%), with younger professionals (44.7%) dominating the Nigerian e-commerce workforce. Furthermore, 90.7% of firms reported using big data tools such as Google Analytics, CRM dashboards, BI software, or Excel-based analytics, confirming that data-driven marketing practices are gaining traction in Nigeria. The Kaiser-Meyer-Olkin (KMO) value of 0.821 and Bartlett's Test of Sphericity ( $\chi^2 = 845.3$ ,  $p < 0.001$ ) indicated sampling adequacy and suitability for factor analysis, confirming the reliability of the dataset. Descriptive statistics showed high mean scores across key dimensions; Data Collection (4.11), Data Analysis (3.94), and Data-Driven Decision Making (4.06), suggesting that most firms possess moderate-to-high data utilization capacity. However, barriers to adoption (Mean = 2.87) were moderately rated, implying persistent



challenges in full-scale adoption of big data. The correlation analysis showed strong positive associations between big data capabilities (Data Collection, Data Analysis, Data-Driven Decision Making) and Marketing Outcomes, with coefficients ranging between 0.68 and 0.72 ( $p < 0.01$ ). Barriers to adoption, however, were significantly negatively correlated with these variables, demonstrating their dampening effect on marketing performance. Results from the multiple regression analysis ( $R = 0.842$ ,  $R^2 = 0.709$ ,  $F = 152.74$ ,  $p < 0.001$ ) revealed that big data capabilities collectively explain about 70.9% of the variance in marketing outcomes. Each variable; Data Collection ( $\beta = 0.284$ ), Data Analysis ( $\beta = 0.321$ ), and Data-Driven Decision Making ( $\beta = 0.276$ ) had positive and significant effects, while Barriers ( $\beta = -0.219$ ) had a negative significant effect on marketing outcomes. Moreover, large enterprises reported significantly higher marketing outcomes ( $M = 4.21$ ) compared to SMEs ( $M = 3.92$ ;  $t = -3.46$ ,  $p = 0.001$ ), implying that firm size moderates big data benefits due to differences in infrastructure and analytics maturity.

## CONCLUSION

This study examined the role of big data analytics (BDA) on data-driven marketing (DDM) in Nigeria's e-commerce sector. Grounded in both theoretical and empirical analysis, the research has provided robust evidence that the adoption and integration of big data analytics constitute a key strategic enabler of marketing effectiveness, competitive advantage, and customer engagement in digital marketplaces. From the empirical results, it was established that data collection, data analysis, and data-driven decision-making capabilities each exert a positive and significant influence on marketing outcomes among Nigerian e-commerce firms. Firms that systematically collect and analyze data from multiple digital touchpoints tend to achieve superior marketing outcomes.

The study also concludes that while the Nigerian e-commerce ecosystem is becoming increasingly data-centric, challenges persist that limit the optimal use of big data analytics. Notably, barriers such as lack of skilled personnel, high costs of analytics tools, poor data infrastructure, and privacy concerns were identified as

significant constraints. These findings echo those of *Eze et al. (2023)* and *Nwosu and Ibidunni (2022)*, who emphasized that structural and human-capital deficiencies often hinder digital transformation in African SMEs. In the Nigerian context, this underscores the strategic need for investments in digital literacy, data management infrastructure, and analytical culture.

Moreover, the study confirmed that firm size plays a moderating role in determining the degree of benefit derived from big data analytics. Larger enterprises, with more financial and technological resources, demonstrated higher marketing outcomes compared to small and medium-sized firms. This suggests that organizational readiness, infrastructural maturity, and digital literacy are critical factors influencing the extent of big data adoption success.

The conclusion also underscores that data-driven marketing has become a determinant of strategic agility in the digital era. E-commerce firms that leverage big data are better equipped to detect emerging trends, adjust pricing and promotional strategies dynamically, and optimize campaign performance in real-time. This adaptive capacity not only drives sales growth but also enhances brand loyalty and customer retention, which are critical to sustaining profitability in the highly competitive Nigerian digital marketplace. In conclusion, the study affirms that big data analytics is a transformative force for marketing innovation in Nigeria's e-commerce sector. Its adoption enhances strategic decision-making, improves marketing efficiency, and drives superior performance outcomes. However, realizing its full potential requires sustained investment in technology, analytics capability-building, and supportive regulatory and institutional frameworks. If Nigerian firms and policymakers can jointly address the identified barriers, the country's digital economy stands poised to experience unprecedented growth, customer-centric innovation, and stronger global competitiveness.

## RECOMMENDATIONS

The results of this study provide substantial evidence that big data analytics (BDA) significantly enhances marketing outcomes in Nigerian e-commerce firms. However, the findings also revealed persistent barriers, particularly



limited analytical skills, high implementation costs, poor data infrastructure, and inadequate institutional support. In light of these insights, the following recommendations are proposed

### **i .Strengthening Data Analytics Capabilities through Capacity Building**

One of the most pressing barriers identified is the shortage of skilled data professionals in the Nigerian e-commerce industry. Many small and medium-sized enterprises (SMEs) lack personnel proficient in data mining, business intelligence, and digital marketing analytics.

To address this, government agencies (e.g., NITDA, SMEDAN, and the Ministry of Communications, Innovation, and Digital Economy) should collaborate with universities, polytechnics, and professional institutes to develop structured training programs on data analytics, artificial intelligence, and digital marketing strategy.

### **ii .Enhancing Financial Support and Incentives for Big Data Adoption**

Given that the high cost of analytics tools was identified as a key challenge, financial incentives and funding mechanisms should be introduced to support digital transformation initiatives among SMEs.

Government agencies and development partners can create Digital Transformation Grants or Tax Incentives for companies that invest in analytics tools, cybersecurity infrastructure, and workforce development.

### **iii Institutionalizing Data Infrastructure and Digital Ecosystem Development**

The study found that the quality of data infrastructure significantly influences firms' ability to leverage big data tools. Policymakers should prioritize the creation of a national data infrastructure framework that supports data sharing, cloud adoption, and secure storage.

This can be achieved by encouraging partnerships between technology firms, internet service providers, and data centers to enhance broadband penetration and affordable access to analytics platforms.

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