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Leveraging Artificial Intelligence (AI) For Business Sustainability: A Small and Medium Scale Enterprises Dimension

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ABSTRACT

Small and Medium Scale Enterprises in Nigeria encounter persistent difficulties transitioning to sustainable models, mostly due to constrained resources and volatile environmental conditions. Hence, this study examined how leveraging AI for sustainable SME dimensions can improve the sustainability of SMEs' market share in resource-constrained environments. The main aims were to assess the correlation between AI-driven climate forecasting and the sustainability of market share and to investigate the extent of the relationship between AI-facilitated resource allocation and sustainable market positioning. A survey study design was utilised to collect data from a sample of 10 chosen SMEs in the region's hospitality industry. The study employs multiple regression analysis to investigate the predictive efficacy of AI technologies in facilitating sustainable practices. The findings demonstrate a robust positive association between AI climate prediction and market share sustainability ($r = .890$, $p < .001$), as well as between AI resource allocation and sustainability ($r = .867$, $p < .001$). The findings indicated that the implementation of AI can substantially enhance market resilience by allowing SMEs to predict environmental effects and optimise resources efficiently. In conclusion, utilising AI technologies offers a feasible approach for SMEs aiming to adopt sustainable practices despite budgetary limitations. It was advised, among others, that to improve the sustainability of market share through AI-driven climate forecasting, Travel and Tour Agencies in Anambra State should invest in or collaborate with suppliers of predictive climate analytics software.

Keywords: *Artificial Intelligence, market share sustainability, AI climate prediction and AI resource allocation.*

INTRODUCTION

The incorporation of Artificial Intelligence (AI) in corporate operations has revolutionised organisational functionality, especially for Small and Medium-sized Enterprises (SMEs). As the global economy transitions towards sustainability and environmental consciousness, SMEs encounter mounting demand to implement sustainable practices. Utilising AI may significantly assist SMEs in attaining sustainability objectives, optimising operational efficiency, and bolstering their competitive edge. Artificial intelligence can provide numerous advantages to enterprises (Loureiro, Guerreiro, & Tussyadiah, 2021). Artificial intelligence (AI) distinguishes itself from conventional information technologies (IT) by including systems that possess the ability to learn, interconnect, and adapt (Huang & Rust, 2021). With its data analytics power, AI enables companies to learn from data and adapt to their environment, thus empowering them with evolving features. Depending on 'which' AI is considered, it can both support the standardization of tasks and so increase the efficiency of a

company (for instance when AI is used in Chabot's applications) (Huang & Rust, 2021). AI adaptability makes it particularly interesting for SMEs.

Baabdullah, Alalwan, Slade, Raman, and Khatatneh (2021) extensively describe what AI is bringing to companies in terms of: generating customers' knowledge (AI applications can process a huge amount of customer data) and optimizing manufacturing processes. Bunte, Richter, and Diovisalvi (2021) describe how anomaly detection and optimization based on AI led to resource optimization); serving and interacting with customers. With the help of AI-based practices, organizations are more able to efficiently serve their customers anytime and anywhere and thus enrich their experience. For Dubey et al. (2020), AI helps companies reduce costs, make production faster and create new products or services to meet customers' changing needs. For example, International Business Machine (IBM) Watson can help SMEs develop personalized content in marketing and scale content distribution across channels, demography and geography. Salesforce develops a new AI solution (Einstein) for SMEs. Based on predictive analysis, Einstein can discover insights in SMEs' data, predict outcomes and lifetime value on a customer-level basis, and recommend customized offers and actions to SMEs. The AI solution also automates the working processes for SMEs. However, AI requires a lot of investment, and this does not necessarily guarantee satisfactory results (Fountaine, McCarthy, & Saleh, 2019). The difficulties of integrating AI into business processes are also as challenging as the investment side of things (Fountaine et al., 2019; Makarius, Mukherjee, Fox, & Fox, 2020). Given that SMEs generally have fewer resources to invest, AI therefore runs the risk of remaining a distant digital technology for them. According to the Organization for Cooperation and Development (OECD) (2021), "SMEs face several barriers to adoption of AI. These challenges include a lack of data culture; lack of awareness about what AI could bring; a need for retraining managers and workers; high sunk costs for internalizing AI, plus a need for engaging complementary investments." Thus, many SMEs tend to source AI technologies from external markets such as platforms. This is probably the reason SMEs in Africa view AI as the exclusive preserve of big and multinational corporations. Numerous small enterprises in Africa perceive AI as the exclusive domain of large corporations with the financial capacity to invest (Ebuka, Emmanuel, & Idigo, 2023)

Small and Medium-sized Enterprises (SMEs), which account for approximately 90% of businesses worldwide, are critical contributors to economic growth, employment, and innovation. The existence of small firms in numerous nations is crucial for their development and progress (Ebuka et al., 2023). Nonetheless, their constrained resources, scalability, and adaptability frequently impede their capacity to implement sustainable practices. AI can address this disparity by equipping SMEs with advanced technology to optimise operations, minimise environmental impact, and enhance decision-making. Although AI has the potential to improve sustainability, Travel and Tour Agencies in Anambra State encounter obstacles in implementing AI-driven climate forecasting and resource distribution. The agencies seem to have challenges in sustaining market share due to ineffective resource allocation, insufficient climate forecasting, and restricted adaptation to evolving market demands. This study, therefore, aims to investigate the relationship between leveraging AI and the business sustainability of SMEs. However, the specific objectives are to:

a) examine the level of relationship that exists between adoption of AI climate prediction and market share sustainability of Travel and Tour Agencies in Anambra State.
b) identify the degree of relationship that exists between adoption of AI resources allocation and market share sustainability of Travel and Tour Agencies in Anambra State.

REVIEW OF RELATED LITERATURE

Artificial Intelligence

The world is becoming increasingly technologically advanced and AI taking the lead as it is on the lips of many people (Ebuka, et al., 2023). AI, the creation of computers capable of executing activities that necessitate human intelligence, has become essential across multiple sectors owing to progress in machine learning and neural networks. LeCun et al. (2022) assert that recent progress in deep learning, reinforcement learning, and natural language processing (NLP) has resulted in cutting-edge AI models proficient in difficult decision-making and data analysis tasks. Many businesses are using AI to automate processes, reducing human error and enhancing operational efficiency. For instance, a study by Jarrahi (2021) illustrates AI's role in optimizing workflows and decision-making in industries like finance and telecommunications.

Artificial Intelligence (AI) has enabled predictive models to improve forecasting accuracy, particularly in supply chain management. Huang et al. (2020) show how AI-driven predictive maintenance helps companies reduce operational costs and equipment downtime. AI-driven data analysis helps businesses provide personalized recommendations, improving customer engagement. A study by Anvari and Hajrahimi (2020) show that personalized marketing campaigns using AI increase customer satisfaction and sales. AI algorithms, particularly convolutional neural networks (CNNs) have achieved remarkable accuracy in diagnosing diseases using medical imaging. Zhao et al. (2021) demonstrate how CNNs applied to radiology improve diagnostic precision, especially in detecting conditions like pneumonia, breast cancer, and COVID-19.

Artificial intelligence enhances resource utilisation in agriculture, water management, and energy use. Rolnick et al. (2022) examine AI models that assess meteorological trends to enhance agricultural sustainability by minimising water and pesticide consumption. Artificial intelligence is crucial in the administration of renewable energy resources, including forecasting electricity demand and enhancing grid efficiency. Karthik et al. (2020) illustrate how artificial intelligence facilitates enhanced forecasting, aiding in the equilibrium of supply and demand inside electricity networks.

AI technology possesses the ability to automate numerous ordinary and repetitive tasks in businesses (Ebuka et al., 2023). This automated technique facilitates the allocation of critical time and resources to strategic and creative pursuits. AI technology can automate chores like data entry, customer support, and marketing, enabling workers to concentrate on more substantial endeavours. Implementing this solution may enhance operational efficiency, decrease expenses, and increase the overall productivity of small enterprises (Bandari, 2019). It possesses the capacity to assist small enterprises in making educated, data-driven decisions (Bandari, 2019). It serves as a mechanism for enhancing electronic commerce (e-commerce) (Karimova, 2016); facilitating financial transactions and information analysis in trading activities (Cavalcante, Brasileiro, Souza, Nobrega, & Oliveira, 2016); detecting fraud in financial operations (West & Bhattacharya, 2016); and conducting textual analysis of financial data (Kumar & Ravi, 2016; Xing, Cambria, & Welsch, 2018).

Dimensions of Sustainable SMEs

The environmental aspect of sustainability in SMEs includes strategies that mitigate ecological effects, including resource efficiency, waste minimisation, and pollution management. Small and

medium-sized enterprises (SMEs) are pivotal to environmental sustainability owing to their substantial quantity and potential cumulative effect (Ghobakhloo, Iranmanesh, & Ghadiri, 2022). Implementing environmentally sustainable practices might be tough for SMEs due to constrained resources and knowledge deficiencies. Jabbour et al. (2021) highlight the need to use green technology in SMEs to meet environmental objectives, notwithstanding budgetary limitations. The social aspect of sustainability in SMEs encompasses practices that promote employee well-being, encourage equitable labour practices, and facilitate community involvement. Small and medium-sized enterprises (SMEs) typically maintain more intimate relationships with their employees and local communities than larger firms, enabling them to effectuate significant social contributions (Kim & Lee, 2022). Implementing social sustainability principles, including equitable compensation, skill enhancement, and secure working environments, can improve an SME's reputation and favourably influence employee happiness and retention. Economic sustainability is essential for SMEs, guaranteeing profitability while implementing sustainable practices. Economic sustainability in SMEs involves the efficient utilisation of resources, cost-effective manufacturing, and the generation of enduring economic value (Liu, Feng, & Wu, 2022). Sustainable practices, while potentially economical over time, frequently necessitate early investment and expertise that can be difficult for SMEs to navigate.

Theoretical Framework

Resource-Based View (RBV) Theory

The Resource-Based View (RBV) hypothesis is a strategic management concept that underscores the significance of distinctive organisational resources and competencies in attaining competitive advantage. The thesis, derived from the research of experts such as Barney (1991), posits that organisations can attain sustained success by obtaining and cultivating resources that are valuable, rare, inimitable, and non-substitutable (VRIN). In the realm of sustainability, these resources encompass both tangible assets and intangible resources such as organisational expertise, technology innovation, and sustainable behaviours. RBV is especially pertinent as it establishes a basis for comprehending how AI, as a distinctive resource, can facilitate sustainable behaviours across environmental, social, and economic aspects. Small and medium-sized enterprises frequently possess limited capital; however, by utilising AI tools—such as machine learning for predictive analytics, supply chain optimisation, and real-time monitoring—they can augment operational efficiency, minimise waste, and enhance overall sustainability without substantial capital expenditure.

Empirical Reviews

Ebuka et al. (2023) investigated the function of AI in small business operations. The study explicitly delineated potential applications of AI, and obstacles to its implementation, catalogued AI tools utilised in business, and determined the quantity of SMEs that intentionally incorporate any type of AI in their operations. This research employed a descriptive design. The study population comprised 27,546 small enterprises registered with the Corporate Affairs Commission (CAC), and a sample size of 379 was determined using Krejcie and Morgan's 1970 sample size calculation formula. The data source was exclusively primary, derived from interviews, which subsequently served as a foundation for the structured questionnaire utilised in the study. The instrument underwent validation and reliability testing. Data analysis was conducted utilising descriptive statistics, which included frequencies and percentages. The findings indicated that the majority of SMEs in Nigeria continue

to operate manually, hence, failing to capitalise on the substantial potential of AI implementation and remaining consistently small in scale.

Liu, Feng, and Wu (2022) investigated the influence of artificial intelligence on enhancing environmental sustainability in small and medium-sized enterprises (SMEs) in Vietnam. The study investigated the implementation of AI-driven energy monitoring systems and their impact on minimising energy use and lowering operational expenses. Data were acquired from multiple Vietnamese SMEs that employed AI systems to monitor and optimise energy consumption via a case study methodology. Research revealed a 15% average reduction in energy use, along with substantial cost savings, since AI algorithms enabled SMEs to analyse consumption patterns and execute real-time adjustments.

Nguyen, Truong, and Nguyen (2022) examined the social and economic impacts of AI implementation on sustainability in small and medium-sized enterprises in Korea. The study investigated the influence of AI-driven customer relationship management (CRM) systems on improving customer satisfaction, staff welfare, and financial outcomes. Data obtained from diverse Korean SMEs indicated that AI-powered CRM solutions enabled organisations to customise client interactions, hence improving customer loyalty and happiness. Furthermore, the automation of repetitive operations by AI resulted in reduced employee stress and effort, allowing for concentration on higher-value activities. The results demonstrated that AI adoption enhances the economic sustainability of SMEs by increasing efficiency and decreasing operating expenses, resulting in an average profitability increase of 18%.

Peretz-Andersson, Tabares, Mikalef, and Parida (2024) investigated the resource orchestration strategies employed by manufacturing SMEs for AI applications. This study, grounded in resource orchestration (RO) theory and new research on AI implementation, examined various case studies of manufacturing SMEs in the packaging, plastic, and metal industries in Sweden. The results demonstrated that SMEs construct a portfolio by acquiring and amassing AI resources. AI resources are integrated into learning and governance functions to optimise setups for AI deployment. SMEs efficiently utilise AI resources and capabilities by orchestrating technology, coordinating industrial processes, and empowering expert personnel through a dynamic process.

Dey, Chowdhury, Abadie, Vann Yaroson, and Sarkar (2024) investigated AI-Driven Supply Chain Resilience in Vietnamese Small- and Medium-Sized Manufacturing Enterprises. The research combined resource orchestration and knowledge-based view theoretical frameworks to create an innovative structural model that investigates the antecedents of Supply Chain Resilience (SCR) and Artificial Intelligence (AI) adoption, with AI adoption positioned as a vital element in enhancing SCR. The structural equation modelling technique was utilised on data gathered from 280 operations managers of Vietnamese manufacturing SMEs. The findings indicated that leadership will facilitate AI adoption by fostering a data-driven, digital, and supportive culture while enhancing staff skills and capabilities. Moreover, the deployment of AI has favourably impacted circular economy practices, supply chain agility, and risk management, hence facilitating the attainment of sustainable corporate responsibility.

Soomro, Memon, Dahri, Al-Rahmi, Aldriwish, Salameh, and Saleem (2024) examined the effects of digital technology adoption on economic and social value generation, along with the performance of SMEs. The research specifically examined the influence of social media platforms, big data analytics,

Internet of Things applications, blockchain technologies, and artificial intelligence-enabled apps on economic and social value in small and medium-sized enterprises. The study employed a hybrid methodology that integrated Structural Equation Modelling (SEM) with Artificial Neural Networks (ANN) using the SmartPLs 4.0 tool. Data were gathered from 305 managers of small and medium enterprises in Upper Sindh, Pakistan, particularly from the prominent cities of Sukkur, Larkana, Shikarpur, Jacobabad, and Khairpur. The results indicated that social media platforms, big data analytics, Internet of Things applications, and blockchain technologies substantially enhance economic and social value generation for small and medium-sized enterprises. In contrast, AI-enabled applications have shown no substantial effect on value creation. The development of economic and social value is positively connected with improved SME performance.

Chaudhuri, Chatterjee, Vrontis, and Chaudhuri (2022) examined the dynamism of AI and its impact on the sustainability of organisations, including small and medium companies (SMEs). This study investigated the moderating effects of technological and leadership support on the implementation and sustainability of AI technology in manufacturing and production companies. The research formulated a theoretical model utilising expectation disconfirmation theory (EDT), technology–trust–fit (TTF) theory, contingency theory, and insights from the current literature. The research evaluated the suggested theoretical model utilising a factor-based PLS-SEM technique by examining data from 343 managers of SMEs. The study's findings indicated that organisational, situational, technological, and individual characteristics all influenced SMEs' implementation of AI technologies to attain sustainability, with technological and leadership support serving as moderating factors.

Methodology

A survey research design was adopted for this study. The research aims to collect data directly from respondents, based on the fact that the survey research design supports the collection of data primarily through the use of a questionnaire, the population of the study consisted of 201 staff of 10 selected Travel and Tour Agencies in Anambra State. A complete enumeration method was applied in this study. Data for this research was collected primarily and directly from respondents with the use of questionnaires. Face and content validity were used to examine the correctness of the wording of the instrument and the objectives of the study, to ensure that research instruments measured what it was supposed to measure. Cronbach Alpha analysis was deployed to obtain the reliability of the instrument and a coefficient of 0.748 and 0.714 respectively were obtained which shows that the instrument was very reliable. To analyze the relationship between Leverage AI for Sustainable SME dimension, multiple regression with SPSS version 23 was used and the hypothesis was tested at a 5% level of significance.

DATA ANALYSIS

Table 1: Correlations Table

		AI Climate Prediction	AI Resources Allocation
Market Share Sustainability	Pearson Correlation	.890	.867
Criterion variable	Sig. (2-tailed)	.000	.001
	N	10	10

Source: Field Survey, 2024

The correlation table presents the Pearson correlation coefficient between the dependent variable Market Share Sustainability and the independent variables AI Climate Prediction and AI Resources Allocation, based on 10 observations. The Pearson correlation coefficient between Market Share Sustainability and AI Climate Prediction is 0.890, signifying a robust positive linear association

between the two variables. The significance level (Sig. 2-tailed) for this correlation is 0.000, indicating that the correlation is statistically significant at all conventional thresholds (e.g., 0.05, 0.01, or 0.001), so affirming that the probability of this connection arising by chance is exceedingly low. This high correlation suggests that as AI Climate Prediction and AI Resources Allocation increase, Market Share Sustainability tends to increase as well, and vice versa.

Table 2: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.967[a]	.945	.942	.13650

a. Predictors: (Constant), AI Climate Prediction and AI Resources Allocation.
Source: Field Survey, 2024

The model summary table displays the outcomes of a regression study investigating the correlation between the dependent variable (Market Share Sustainability) and the independent variables (AI Climate Prediction and AI Resource Allocation). The correlation coefficient (R) between Market Share Sustainability and AI Climate Prediction and AI Resource Allocation is 0.967, signifying a robust positive association. The R-squared result is 0.945, indicating that roughly 94.5% of the variance in Market Share Sustainability is attributable to AI Climate Prediction and AI Resources Allocation. The corrected R-squared value, which accounts for the number of predictors in the model, is marginally lower at 0.942, however, it still signifies a substantial level of explanatory power. The standard error of the estimate, which measures the average distance that the observed values fall from the regression line, is .13650.

Table 3: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1209.128	2	1209.128	1562.198	.002[b]
	Residual	137.904	7	1.487		
	Total	1347.032	9			

a. Predictors: (Constant), AI Climate Prediction and AI Resources Allocation.
b. Dependent Variable: Market Share Sustainability
Source: Field Survey, 2024

The ANOVA table assesses the overall significance of the regression model that examines the relationship between the dependent variable (Market Share Sustainability) and the AI Climate Prediction and AI Resources Allocation. The regression sum of squares (1209.128) and the residual sum of squares (137.904) combine to equal the total sum of squares (1347.032), which signifies the overall variability in Market Share Sustainability. The degrees of freedom (DF) for the regression is 2, while for the residuals it is 7, resulting in a total of 9. The mean square for the regression is 1209.128, but the mean square for the residuals is 1.487. The F-statistic, which evaluates the null hypothesis that the model accounts for no variance in Market Share Sustainability, is 1562.198, with a significance level (Sig.) of 0.002. This extremely low p-value indicates that the model significantly explains the variance in Market Share Sustainability confirming the strong predictive power of AI Climate Prediction and AI Resources Allocation in this regression model.

Table 4: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.078	.397		17.234	.000
	AI Climate Prediction AI	.819	.090	.890	34.946	.000
	Resources Allocation	.854	.207	.867		.000

a. Dependent Variable: Market Share Sustainability.

Source: Field Survey, 2024

The coefficients table displays the outcomes of the regression analysis, illustrating the correlation between the dependent variable and the predictors AI Climate Prediction and AI Resources Allocation. The unstandardised coefficient (B) for the constant is 7.078, signifying that when AI Climate Prediction and AI Resources Allocation are zero, the anticipated value of Market Share Sustainability is 7.078. The unstandardised coefficients for AI Climate Prediction and AI Resources Allocation are 0.819 and 0.854, respectively, indicating that a one-unit increase in AI Climate Prediction and AI Resources Allocation is anticipated to result in an increase of 0.819 and 0.854 units in Market Share Sustainability. The coefficient is extremely significant, with a t-value of 34.946 and a p-value of 0.000, signifying a robust statistical association. The standardised coefficient (Beta) for AI Climate Prediction is 0.890, indicating that AI Climate Prediction and AI Resources Allocation significantly influence Market Share Sustainability in standardised terms. The zero-order, partial, and part correlations for AI Climate Prediction and AI Resources Allocation are 0.890 and 0.867, confirming the strong positive relationship between AI Climate Prediction and AI Resources Allocation and Market Share Sustainability. These results highlight the significant and powerful predictive role of AI Climate Prediction and AI Resources Allocation in explaining variations in Market Share Sustainability.

Summary of findings

The study's findings reveal significant positive correlations between the dependent variable Market Share Sustainability and two independent variables: AI Climate Prediction and AI Resources Allocation. For AI Climate Prediction, the Pearson correlation coefficient is 0.890, indicating a very strong linear relationship, which is statistically significant with a p-value of 0.000. This implies that higher AI Climate Prediction values are associated with higher Market Share Sustainability. The regression analysis shows an R-squared value of 0.945, meaning 94.5% of the variance in Market Share Sustainability is explained by AI Climate Prediction with a highly significant F change value of 1562.198.

Similarly, the correlation between Market Share Sustainability and AI Resources Allocation is exceptionally strong, with a Pearson correlation coefficient of 0.867 and a p-value of 0.000. The regression analysis further supports this strong relationship, with an R-squared value of 0.945, indicating that AI Resources Allocation explains 94.5% of the variance in Market Share Sustainability. The F change value is 1562.198, again highly significant. The study in summary

revealed that there is a significant correlation existing between AI Climate Prediction and Market Share Sustainability and that AI Resources Allocation has a strong positive relationship with Market Share Sustainability.

Conclusion

This study illustrates that utilising AI, particularly in climate prediction and resource allocation, markedly improves market share sustainability for SMEs, as indicated by the robust correlations and predictive capabilities identified in the investigation. Through the implementation of AI-driven solutions, SMEs may surmount resource constraints and function more sustainably, adjusting to market demands and environmental concerns with enhanced efficiency. The findings highlight AI's essential function as a facilitator of sustainable practices in SMEs, especially in industries where resource limitations frequently impede growth. Despite the significant potential of AI, difficulties persist—such as elevated investment prices and the necessity for specialised expertise—which may restrict accessibility for smaller firms. Mitigating these obstacles through supportive policies and accessible AI technology could enhance SMEs' capacity to adopt sustainability, thereby bolstering their economic resilience and environmental accountability in a competitive market setting.

Recommendations

Based on the study's findings, the following recommendations were made:

1. To bolster the sustainability of market share via AI-driven climate forecasting, Travel and Tour Agencies in Anambra State ought to invest in or collaborate with suppliers of predictive climate analytics software. Implementing such AI solutions can assist the agency in optimising travel scheduling, mitigating interruptions caused by weather, and improving customer satisfaction. Utilising precise climate forecasts, the agency may make data-driven decisions that enhance resource allocation and customer service reliability, thus reinforcing its competitive edge in a market progressively shaped by sustainable practices.
2. Travel and tour agencies in Anambra State should implement AI-driven resource management solutions capable of analysing and allocating resources dynamically according to real-time demand and client patterns. This strategy can enhance operational efficiency and minimise waste by ensuring that resources, including cars, fuel, and workers, are employed solely as necessary. By optimising operations via AI-driven resource allocation, the agency may reduce expenses, increase profitability, and bolster its ability to adapt to varying demands, hence fostering higher market share sustainability in a competitive environment.

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