EFFECT OF E-COMMERCE UTILIZATION ON SMES PERFORMANCE IN ANAMBRA STATE

[1]Edokobi, Tonna David*, [2]Okoli, Ikechukwu Moses, [3]Ugochukwu, Marius Ndubuisi
[1] Department of Business Administration, Nnamdi Azikiwe University, Awka, Anambra, Nigeria
[2] Department of Cooperative Economics and Management, Nnamdi Azikiwe University, Awka, Anambra, Nigeria [3] Department of Business Administration, Federal University of Kashere Gombe, Nigeria,
**Corresponding author: td.edokobi@unizik.edu.ng*

Abstract
This study examined the effect of e-commerce utilization on the performance of small and medium-sized enterprises (SMEs) in Anambra State, Nigeria, by deploying the Vector Autoregression (VAR) model. The analysis focused on the impact of online sales, digital marketing, e-payment systems, website quality, and social media engagement on operational efficiency of small and medium-sized enterprises. Data were collected from a representative sample of SMEs across Anambra State and analysed using econometric regression techniques. The empirical results indicated that online sales ($\beta = 0.28$, $p < 0.01$) and digital marketing ($\beta = 0.33$, $p < 0.01$) have a statistically significant positive impact on operational efficiency, highlighting their critical role in enhancing SME performance. E-payment systems also exhibited a positive effect ($\beta = 0.21$, $p < 0.05$), emphasizing the importance of efficient transaction processes. Website quality was positively correlated with operational efficiency ($\beta = 0.25$, $p < 0.05$), suggesting that a user-friendly online presence is essential for operational success. However, social media engagement showed a complex relationship ($\beta = 0.12$, $p > 0.05$), indicating that while it is beneficial for brand awareness, its direct impact on operational efficiency may be mediated by other factors. The VAR model also revealed significant dynamic interactions among the variables, with Granger causality tests confirming that changes in online sales and digital marketing significantly predict future changes in operational efficiency. Impulse response functions further demonstrated that shocks to online sales and digital marketing have lasting positive effects on operational efficiency over time. These findings provide valuable insights for SME owners, policymakers, and stakeholders in Anambra State. They underscore the necessity for continuous investment in e-commerce infrastructure and strategic utilization of online sales and digital marketing to sustain and enhance operational efficiency. The study thus recommends among others that SMEs should prioritize the development and optimization of online sales platforms to capitalize on the significant positive impact on operational efficiency, and that SMEs should implement and encourage the use of e-payment systems to streamline transactions and enhance customer satisfaction.

Keywords: *E-commerce, SMEs, Operational Efficiency, Vector Autoregression (VAR), Online Sales, Digital Marketing, E-Payment Systems, Website Quality, Social Media Engagement, Anambra State*

Introduction

E-commerce has revolutionized business operations worldwide, providing numerous opportunities for small and medium-sized enterprises (SMEs) to enhance their performance. This transformative technology enables SMEs to overcome traditional market limitations, streamline operations, and access new customer bases (Laudon & Traver, 2020). In developing economies like Nigeria, where SMEs are pivotal to economic growth and employment, e-commerce adoption is crucial for improving business outcomes and competitiveness (Adeleke et al., 2018). Arguably, the Nigerian economy heavily relies on SMEs, which constitute about 96% of businesses, 84% of employment, and 48% of the national GDP (SMEDAN & NBS, 2021). Despite their touted significance, Nigerian SMEs face numerous challenges, including limited access to finance, inadequate infrastructure, and intense competition (Edoko, Agbasi, & Ezeanolue, 2018; Anigbogu, Okoli & Nwakoby, 2015)). E-commerce therefore is seen as offering a potential solution by providing platforms for SMEs to enhance their market reach and operational efficiency. However, its adoption among Nigerian SMEs remains relatively low, necessitating a deeper understanding of its impact on business performance (Oyelaran-Oyeyinka & Lal, 2016).

E-commerce utilization encompasses various components, such as online sales, digital marketing, and e-payment systems. Online sales platforms allow SMEs to reach a broader customer base beyond their immediate geographic location, increasing sales volume and revenue (Zwass, 2016). Digital marketing strategies, including social media marketing, search engine optimization, and email marketing, provide cost-effective means to promote products and services, enhancing market visibility and customer engagement (Chaffey & Ellis-Chadwick, 2019). E-payment systems facilitate seamless and secure financial transactions, reducing the reliance on cash and minimizing transaction costs and time (Turban et al., 2018). Website quality also plays a critical role in e-commerce success. A user-friendly, well-designed website attracts and retains customers, facilitates smoother transactions, and enhances overall operational efficiency (Gefen et al., 2003). Additionally, social media engagement helps SMEs build brand awareness, engage with customers, and gather valuable market insights (Kaplan & Haenlein, 2010). Understanding the impact of these e-commerce components on SMEs' performance is essential for developing effective strategies to enhance business outcomes.

This study focuses on SMEs in Anambra State, a region with a vibrant entrepreneurial ecosystem but significant infrastructure and economic challenges. Anambra State's strategic location and dynamic business environment make it a critical area for examining the impact of e-commerce on SMEs (Nwagwu, 2018). By investigating how different e-commerce practices affect operational efficiency, this study aims to provide insights that can help SMEs in Anambra State and similar regions leverage digital technologies for growth and competitiveness. Empirical evidence suggests that online

sales and digital marketing significantly enhance operational efficiency. For instance, a study by Karakaya and Shea (2008) found that online sales platforms enable businesses to increase revenue and reduce operational costs. Similarly, digital marketing has been shown to improve market reach and customer engagement, leading to better business performance (Bala & Verma, 2018). These findings highlight the importance of adopting robust online sales and digital marketing strategies for SMEs aiming to optimize their operations.

E-payment systems also positively impact operational efficiency by streamlining transaction processes. Research by Laudon and Traver (2020) indicated that efficient e-payment systems reduce transaction costs, improve cash flow management, and enhance customer satisfaction. This study's findings are expected to corroborate these results, emphasizing the need for SMEs to invest in reliable e-payment solutions to optimize their business operations. Website quality and social media engagement are additional factors influencing e-commerce success. A high-quality website not only improves customer experience but also supports effective e-commerce operations (Gefen et al., 2003). While social media engagement primarily enhances brand awareness and customer interaction, its direct impact on operational efficiency may be mediated by other factors, such as customer loyalty and feedback (Kaplan & Haenlein, 2010). Understanding these dynamics is crucial for developing comprehensive e-commerce strategies that address various aspects of business performance.

This study aims to provide a detailed analysis of the effect of e-commerce utilization on SMEs' performance in Anambra State, Nigeria. By examining the impact of online sales, digital marketing, e-payment systems, website quality, and social media engagement on operational efficiency, the research seeks to offer actionable insights for SME owners and policymakers. The study is expected to underscore the necessity for continuous investment in e-commerce infrastructure and strategic utilization of digital tools to sustain and enhance SME performance in the digital economy.

1. Statement of the Problem

The rapid growth of e-commerce globally has revolutionized business operations, offering unprecedented opportunities for SMEs to enhance their performance through increased market reach, operational efficiency, and cost reduction (Laudon & Traver, 2020). However, in Nigeria, particularly in Anambra State, the adoption and effective utilization of e-commerce by SMEs remain significantly low (Oyelaran-Oyeyinka & Lal, 2016). Despite the potential benefits, many SMEs struggle to integrate e-commerce into their business models, thereby limiting their competitive edge and growth prospects in an increasingly digital economy (Aremu & Adeyemi, 2011). One major problem facing SMEs in Anambra State is the lack of infrastructure and technological know-how required to implement effective e-commerce solutions. This digital divide hinders many SMEs from capitalizing on the advantages of e-commerce, such as

expanded customer bases and streamlined operations (Adeleke et al., 2018). The absence of reliable internet access, inadequate technical support, and insufficient knowledge about digital tools create significant barriers to e-commerce adoption, exacerbating the challenges faced by these enterprises in improving their performance and sustainability (Adebayo, 2019).

Access to finance is a persistent challenge for SMEs in Nigeria, making it difficult for them to acquire the technologies and expertise needed to leverage e-commerce effectively (Aremu & Adeyemi, 2011). Without adequate financial resources, SMEs cannot develop or maintain high-quality websites, implement secure e-payment systems, or engage in robust digital marketing strategies, all of which are critical components of successful e-commerce operations (Kehinde & Abiodun, 2018). Additionally, there is a considerable gap in the understanding of how specific e-commerce practices impact the performance of SMEs in the local context of Anambra State. While studies have shown the positive effects of e-commerce on business performance in developed countries, there is a lack of empirical evidence on how these benefits translate to SMEs in developing regions (Oyelaran-Oyeyinka & Lal, 2016). This gap in knowledge makes it difficult for policymakers and business owners to develop targeted strategies that address the unique challenges and opportunities presented by e-commerce in Anambra State (Nwagwu, 2018). Furthermore, the regulatory environment in Nigeria poses significant challenges for SMEs attempting to adopt e-commerce. Issues such as cyber security, data privacy, and lack of supportive legal frameworks deter many businesses from fully embracing digital platforms (Adebayo, 2019). The absence of clear regulations and policies to protect online transactions and consumer rights add to the risk and uncertainty faced by SMEs, further inhibiting their ability to leverage e-commerce for performance enhancement (Laudon & Traver, 2020).

Additionally, the complexity of integrating various e-commerce components, such as online sales, digital marketing, and e-payment systems, also presents a significant challenge. SMEs may need to adopt a holistic approach to e-commerce, ensuring that all elements work synergistically to improve operational efficiency and business outcomes. However, many SMEs seem to lack the strategic vision and operational capabilities to implement such an integrated approach, which may have resulted in suboptimal utilization of e-commerce technologies. Consequently, the underutilization of e-commerce by SMEs in Anambra State can be attributed to a combination of infrastructural deficiencies, financial constraints, regulatory challenges, and knowledge gaps. Addressing these issues is critical to enable SMEs harness the full potential of e-commerce in order to enhance their performance and competitiveness. This study thus aims to fill this empirical gap by examining the specific effects of e-commerce utilization on SMEs' performance in Anambra State and providing actionable insights

for policymakers and business owners to foster a more conducive environment for digital transformation.

2. Objectives of the Study

The broad objective of the study is to examine the effect of e-commerce utilization on SMEs performance in Anambra State, Nigeria. The specific objectives are to:

- **i.** Ascertain the effect of online sales on operational efficiency of SMEs in Anambra State.
- **ii.** Determine the effect of digital marketing on operational efficiency of SMEs in Anambra State.
- **iii.** Examine the effects of e-payment systems on operational efficiency of SMEs in Anambra State.
- **iv.** Evaluate the effect of website quality on operational efficiency of SMEs in Anambra
- **v.** Determine the effect of social media engagement on operational efficiency of SMEs in Anambra

3. Research Hypotheses

Ho_1: Online sales have no significant effect on operational efficiency of SMEs in Anambra State

Ho_2: Digital marketing has no significant effect on operational efficiency of SMEs in Anambra State

Ho_3: E-payment systems have no significant effect on operational efficiency of SMEs in Anambra State

Ho_4: Website quality has no significant effect on operational efficiency of SMEs in Anambra

Ho_5: Social media engagement has no significant effect on operational efficiency of SMEs in Anambra

Review of Related Literature

E-commerce has revolutionized business operations globally, providing new avenues for sales, marketing, and customer engagement. In Nigeria, particularly in Anambra State, SMEs are increasingly leveraging e-commerce to enhance their operational efficiency. This literature review examines the impact of online sales, digital marketing, e-payment systems, website quality, and social media engagement on the operational efficiency of SMEs in Anambra State.

Online Sales

Online sales platforms enable SMEs to reach a broader customer base, reduce operational costs, and streamline their sales processes. According to Tarek (2020), SMEs that adopt online sales platforms experience increased sales volumes and reduced transaction costs, which significantly enhance their operational efficiency. In Nigeria, Odukoya and Ogunnaike (2019) found that SMEs utilizing online sales channels report

improved inventory management and customer satisfaction, leading to overall operational efficiency.

Digital Marketing

Digital marketing, including search engine optimization (SEO), pay-per-click (PPC) advertising, and email marketing, allows SMEs to target specific audiences more effectively. Kotler et al. (2021) argue that digital marketing strategies enable SMEs to achieve better market penetration and customer retention. In Anambra State, Eze and Nwankwo (2018) highlight that SMEs employing digital marketing strategies see a notable increase in brand visibility and customer engagement, which translates to improved operational efficiency.

E-payment Systems

E-payment systems provide a secure and efficient method for handling transactions. According to Laudon and Traver (2022), the adoption of e-payment systems reduces transaction time and enhances cash flow management. In Nigeria, Alabi and Oyewole (2020) observed that SMEs using e-payment systems benefit from reduced transaction costs and improved financial record-keeping, contributing to enhanced operational efficiency.

Website Quality

The quality of SME's website, including its design, user-friendliness, and functionality, plays a crucial role in attracting and retaining customers. Zeithaml et al. (2020) emphasized that high-quality websites enhance customer experience and trust. In Anambra State, Nwachukwu and Okoye (2019) found that SMEs with well-designed websites experience higher customer engagement and conversion rates, which boost operational efficiency.

Social Media Engagement

Social media platforms offer SMEs a cost-effective means to engage with customers, promote products, and gather feedback. Kaplan and Haenlein (2021) state that active social media engagement can significantly enhance customer relationships and brand loyalty. In Nigeria, Adeoye and Elegunde (2020) reported that SMEs leveraging social media for customer engagement see improved customer satisfaction and operational efficiency.

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Theoretical Framework

This study is anchored on Technology Acceptance Model (TAM) and the Resource-Based View (RBV) as our theoretical lenses.

Technology Acceptance Model (TAM)

Proponents of the Theory

The Technology Acceptance Model (TAM) was proposed by Davis (1989) and later expanded by Venkatesh and Davis (2000).

Tenets and Assumptions of the Theory

Perceived Usefulness (PU)**:** The degree to which a person believes that using a particular system would enhance their job performance.

Perceived Ease of Use (PEOU)**:** The degree to which a person believes that using a particular system would be free of effort.

Behavioural Intention to Use (BI)**:** The extent to which a person intends to use a system, influenced by PU and PEOU.

Actual System Use**:** The real utilization of the technology.

Users' perceptions of usefulness and ease of use influence their attitudes toward using the technology while positive attitudes lead to higher intention to use and actual adoption of the technology.

Applications of the Theory to the Study

TAM helps explain why SMEs in Anambra State adopt e-commerce technologies based on perceived benefits and ease of use. Understanding the factors influencing technology acceptance can guide interventions to increase e-commerce adoption, thus enhancing operational efficiency.

Resource-Based View (RBV)

Proponents of the Theory

The Resource-Based View (RBV) was articulated by Wernerfelt (1984) and further developed by Barney (1991).

Tenets and Assumptions of the Theory

Resource Heterogeneity**:** Firms possess unique resources and capabilities that are not evenly distributed across firms.

Resource Immobility**:** Resources cannot be easily transferred from one firm to another and are difficult to replicate.

Valuable, Rare, Inimitable, and Non-substitutable (VRIN)**:** For a resource to provide a competitive advantage, it must be valuable, rare, inimitable, and non-substitutable.

The heterogeneity and immobility of resources are central to gaining and sustaining a competitive advantage.

Firms must therefore leverage their unique resources and capabilities to improve operational efficiency and achieve better performance.

Applications of the Theory to the Study

RBV helps identify how e-commerce tools (resources) can be leveraged by SMEs to gain a competitive advantage and enhance operational efficiency.

By focusing on unique resources such as website quality, digital marketing capabilities, and social media engagement, SMEs can improve their operational processes and market position.

Integration of TAM and RBV

Integrating TAM and RBV provides a comprehensive framework for understanding the adoption and impact of e-commerce on SMEs' operational efficiency. TAM explains the initial acceptance and usage of e-commerce technologies, while RBV focuses on how these technologies, as unique resources, can be utilized to enhance operational efficiency and competitive advantage.

The Technology Acceptance Model (TAM) and the Resource-Based View (RBV) therefore offer valuable insights into the factors influencing the adoption of e-commerce and its impact on operational efficiency. TAM addresses the psychological and behavioral aspects of technology acceptance, while RBV emphasizes the strategic utilization of unique resources. Together, they provide a robust framework for analyzing the effect of e-commerce utilization on the operational efficiency of SMEs in Anambra State, Nigeria.

Methodology

Research Design

This study employs a quantitative research design to examine the effect of e-commerce utilization on the operational efficiency of SMEs in Anambra State, Nigeria. The research utilizes the Vector Autoregression (VAR) model to analyze the dynamic relationships between e-commerce variables and operational efficiency.

Area of Study

This study was carried out in Anambra State, located in South-Eastern Nigeria. Anambra, named after the Anambra River ("Oma Mbala"), has its capital in Awka, with Onitsha and Nnewi as major commercial hubs (Eze, 2010). Bordered by Delta, Imo, Rivers, Enugu, and Kogi states, Anambra is predominantly inhabited by the Igbo ethnic group, with a small Igala population. It is the eighth most populated and the second most densely populated state in Nigeria (Okeke, 2012). The state is rich in natural resources like natural gas, crude oil, bauxite, and ceramics, and boasts nearly 100% arable soil. Anambra also excels in agriculture, fisheries, and animal husbandry, and currently has one of the lowest poverty rates in Nigeria (Nwafor, 2008).

Population and Sample Size of the Study

The study on the effect of e-commerce utilization on SMEs performance in Anambra State used a multi-staged sampling technique. SMEs were sampled from five major economic hubs: Awka, Ogidi, Onitsha, Nnewi, and Ekwulobia. The population and sample size data were sourced from the Ministry of Commerce, Industry, and Tourism.

Population Distribution

Table 1: The total population of SMEs in the five economic hubs is as follows:

Economic Hub	**Total Population of SMEs**
Awka	1,200
Ogidi	800
Onitsha	2,500
Nnewi	1,500
Ekwulobia	1,000
Total	**7,000**

Sample Size Distribution

Table 2: A sample size of 216 SMEs was determined and proportionately allocated based on the population of each economic hub.

Economic Hub	**Total SMEs**	**Proportion of Total Population (%)**	**Sample Size (n=216)**
Awka	1,200	17.14%	37
Ogidi	800	11.43%	25
Onitsha	2,500	35.71%	77
Nnewi	1,500	21.43%	46
Ekwulobia	1,000	14.29%	31
Total	**7,000**	**100%**	**216**

Explanation

Stage 1: Selection of Economic Hubs

Five major economic hubs (Awka, Ogidi, Onitsha, Nnewi, and Ekwulobia) were identified based on their economic activities and SME presence.

Stage 2: Determination of Total Population

The total population of SMEs in each economic hub was obtained from the Ministry of Commerce, Industry, and Tourism, with a combined total of 7,000 SMEs.

Stage 3: Calculation of Proportions

The proportion of the total population for each hub was calculated by dividing the number of SMEs in each hub by the total population and multiplying by 100.

Stage 4: Determination of Sample Size
A total sample size of 216 SMEs was determined for the study.
The sample size for each hub was calculated by multiplying the proportion of the total population by the total sample size (216).

Stage 5: Proportionate Allocation
The sample size was proportionately allocated to each economic hub based on its population size to ensure representation from all hubs.
This multi-staged sampling technique ensured a representative and comprehensive sample for analyzing the effect of e-commerce utilization on SME performance in Anambra State.

Data Sources
Primary Data**:** Structured questionnaires were administered to the owners and managers of the selected SMEs. The questionnaire items were designed to capture data on the utilization of online sales, digital marketing, e-payment systems, website quality, and social media engagement.
Secondary Data**:** Additional data were obtained from official reports, industry publications, and online databases to complement the primary data.

Measurement of Variables
Dependent Variable
Operational Efficiency**:** Measured using indicators such as sales growth, cost reduction, process improvement, and customer satisfaction.

Independent Variables
Online Sales**:** Assessed by the volume of transactions conducted online.
Digital Marketing**:** Measured by the extent of investment in digital marketing activities and their perceived effectiveness.
E-payment Systems**:** Evaluated based on the adoption and frequency of use of electronic payment methods.
Website Quality**:** Assessed through website functionality, user-friendliness, and content quality.
Social Media Engagement**:** Measured by the frequency and intensity of interactions with customers on social media platforms.

Method of Data Analysis
Data were analyzed using both descriptive and inferential statistics. Descriptive statistics, including frequencies, percentages, means, and standard deviations, processed demographic profiles and the study's objectives. The Vector Auto-regression (VAR) model was used to determine relationships between independent and dependent variables. Hypotheses were tested using T-tests and F-tests to assess model fitness. Analyses were conducted using Stata (StataCorp, 2024; Johnson, 2010). The Vector

Autoregression (VAR) model is employed to analyze the interrelationships among the variables. VAR models are suitable for capturing the dynamic interactions and causal relationships in time series data. The model includes operational efficiency as the dependent variable and online sales, digital marketing, e-payment systems, website quality, and social media engagement as independent variables.

Thus, the model of this study is stated as follows:

The functional form of the model is

$OPE = f(ONS, DGM, EPS, WBS, SME)$…….....(1)

The mathematical form of the model is

$OPE = \beta_0+\beta_1 ONS, +\beta_2 DGM +\beta_3 EPS +\beta_4 WBS +\beta_5 SME$.....(2)

The econometric form of the model is

$OPE = \beta_0+\beta_1 ONS, +\beta_2 DGM +\beta_3 EPS +\beta_4 WBS +\beta_5 SME +\alpha_i$..... (3)

Where; OPE = SMEs Performance proxied by Operational Efficiency
OPE = Operational Efficiency
ONS = Online Sales
DGM = Digital Marketing
EPS = E-payment Systems
WBS = Website Quality
SME = Social Media Engagement
β_0 = Intercept of the model
$\beta_1 – \beta_5$ = Parameters of the model
α_i = Stochastic error term

PRESENTATION OF EMPIRICAL RESULTS

Table 3: Demographic Profile of Respondents (N=216)

Demographic Variable	Frequency	Percentage (%)
Gender		
Male	126	58.3
Female	90	41.7
Age		
18-25	30	13.9
26-35	84	38.9
36-45	72	33.3
46 and above	30	13.9
Education Level		
Secondary	48	22.2
Diploma	78	36.1
Bachelor's Degree	66	30.6
Postgraduate Degree	24	11.1

Demographic Variable	**Frequency**	**Percentage (%)**
Years in Business		
Less than 1 year	27	12.5
1-5 years	75	34.7
6-10 years	56	26.0
Above 10 years	58	26.8

Descriptive Statistics of Variables

Table 4: Descriptive Statistics

Variable	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Online Sales	4.12	0.89	1.00	5.00
Digital Marketing	4.34	0.82	1.00	5.00
E-payment Systems	3.98	0.94	1.00	5.00
Website Quality	4.22	0.87	1.00	5.00
Social Media Engagement	3.87	1.02	1.00	5.00
Operational Efficiency	4.15	0.85	1.00	5.00

Vector Autoregression (VAR) Model Results

Table 5: VAR Model Summary

Statistic	**Value**
R-squared	0.79
Adjusted R-squared	0.76
F-statistic	26.83
Prob(F-statistic)	0.000
Durbin-Watson statistic	1.93

Table 6: VAR Model Coefficients

Variable	**Coefficient (β)**	**Standard Error**	**t-Statistic**	**p-Value**
Online Sales	0.28	0.06	4.67	0.000***
Digital Marketing	0.33	0.07	4.71	0.000***
E-payment Systems	0.21	0.09	2.33	0.020**
Website Quality	0.25	0.10	2.50	0.013**
Social Media Engagement	0.12	0.08	1.50	0.135

***Significant at the 1% level, **Significant at the 5% level

Interpretation of VAR Model Results

R-squared and Adjusted R-squared: The R-squared value of 0.79 indicates that 79% of the variance in operational efficiency is explained by the independent variables. The

Adjusted R-squared value of 0.76 adjusts for the number of predictors in the model and provides a more accurate measure of model fit.

F-statistic: The F-statistic of 26.83 with a p-value of 0.000 suggests that the overall model is statistically significant and that the independent variables collectively have a significant effect on operational efficiency.

Durbin-Watson statistic: The value of 1.93 is close to 2, indicating that there is no significant autocorrelation in the residuals of the model.

Granger Causality Tests

Table 7: Granger Causality Tests

Null Hypothesis	F-Statistic	p-Value
Online Sales does not Granger-cause Operational Efficiency	7.29	0.001***
Digital Marketing does not Granger-cause Operational Efficiency	7.85	0.000***
E-payment Systems does not Granger-cause Operational Efficiency	3.46	0.034**
Website Quality does not Granger-cause Operational Efficiency	4.12	0.019**
Social Media Engagement does not Granger-cause Operational Efficiency	2.05	0.128

***Significant at the 1% level, **Significant at the 5% level

Impulse Response Functions

Interpretation of Impulse Response Functions

Online Sales: Shocks to online sales show a sustained positive impact on operational efficiency, indicating that improvements in online sales have long-term benefits.

Digital Marketing: Shocks to digital marketing similarly exhibit lasting positive effects on operational efficiency, underscoring the importance of continuous investment in digital marketing strategies.

The results of this study provide robust evidence that e-commerce utilization significantly enhances the operational efficiency of SMEs in Anambra State, Nigeria. Online sales, digital marketing, e-payment systems, and website quality are critical factors that positively impact operational efficiency. Social media engagement, while beneficial, requires further exploration to fully understand its direct and indirect effects. These findings highlight the necessity for SME owners and policymakers to invest in and strategically utilize e-commerce tools to sustain and improve operational efficiency in the digital economy.

Discussion of Findings

This study investigated the effect of e-commerce adoption on the operational efficiency of SMEs in Anambra State, Nigeria, using the Vector Autoregression (VAR) model. The analysis focused on five key e-commerce variables: online sales, digital marketing, e-payment systems, website quality, and social media engagement. The empirical

findings underscored the significant relationships between these variables and operational efficiency.

Online Sales: The positive and significant coefficient ($\beta = 0.28$, $p < 0.01$) suggests that online sales substantially enhance operational efficiency. This implies that SMEs effectively leveraging online sales channels experience improved performance metrics such as sales growth and cost reduction (Adeniran & Johnston, 2021).

Digital Marketing: With a significant coefficient ($\beta = 0.33$, $p < 0.01$), digital marketing emerges as a critical driver of operational efficiency. SMEs investing in digital marketing strategies benefit from increased visibility, customer engagement, and overall operational improvements (Kapoor & Agarwal, 2018).

E-payment Systems: The positive impact of e-payment systems ($\beta = 0.21$, $p < 0.05$) underscores the importance of efficient transaction processes in enhancing operational efficiency. SMEs utilizing e-payment systems streamline their operations and improve customer satisfaction (Chinomona & Maziriri, 2019).

Website Quality: The significant positive relationship ($\beta = 0.25$, $p < 0.05$) between website quality and operational efficiency highlights the necessity of a user-friendly online presence. A well-designed website enhances customer experience and operational effectiveness (Yang & Jun, 2019).

Social Media Engagement: Although social media engagement shows a positive coefficient ($\beta = 0.12$, $p > 0.05$), it lacks statistical significance, suggesting that its direct impact on operational efficiency may be mediated by other factors (Islam et al., 2020).

The Granger causality tests confirm that changes in online sales and digital marketing significantly predict future changes in operational efficiency, while impulse response functions demonstrate that shocks to these variables have lasting positive effects (Chong & Ng, 2019).

Conclusion and Recommendations

The study found that:

1. Online Sales significantly enhance operational efficiency ($\beta = 0.28$, $p < 0.01$).
2. Digital Marketing is critical for improving operational efficiency ($\beta = 0.33$, $p < 0.01$).
3. E-payment Systems positively impact operational efficiency ($\beta = 0.21$, $p < 0.05$).
4. Website Quality is essential for operational success ($\beta = 0.25$, $p < 0.05$).
5. Social Media Engagement shows a complex relationship with operational efficiency ($\beta = 0.12$, $p > 0.05$).
6. From the granger causality, online sales and digital marketing significantly predict future changes in operational efficiency.

This study provides robust evidence that e-commerce utilization significantly enhances the operational efficiency of SMEs in Anambra State, Nigeria. Online sales, digital marketing, e-payment systems, and website quality are identified as critical factors that positively impact operational efficiency. While social media engagement is beneficial for brand awareness, its direct impact on operational efficiency requires further

exploration. These findings underscore the importance of e-commerce tools in driving SME performance in the digital economy. Based on the findings of the study, the following recommendations are made:

1. SMEs should prioritize the development and optimization of online sales platforms to capitalize on the significant positive impact on operational efficiency.
2. Continuous investment in digital marketing is essential. SMEs should adopt comprehensive digital marketing strategies to improve visibility, customer engagement, and overall performance.
3. SMEs should implement and encourage the use of e-payment systems to streamline transactions and enhance customer satisfaction.
4. SMEs must invest in creating and maintaining high-quality, user-friendly websites to enhance customer experience and operational efficiency.
5. While social media engagement has a complex relationship with operational efficiency, SMEs should use it strategically for brand awareness and customer engagement, possibly exploring its indirect effects on operations. Policymakers should provide support and training programs to help SMEs adopt and utilize e-commerce tools effectively. This includes offering incentives for digital infrastructure development and skills training.

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