

Digital Transformation and Performance of Food, Beverage and Tobacco Manufacturing Firms in Enugu State, Nigeria

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Abstract

This study evaluated the relationship between digital transformation and the performance of food, beverage, and tobacco manufacturing firms in Enugu State, Nigeria. The specific objectives were to examine the relationship between technological infrastructure and output, and to evaluate the relationship between customer experience and increased revenue generation among food, beverage, and tobacco manufacturing firms in Enugu State. The study was conducted in Enugu State using a descriptive survey research design. Primary data were collected through the administration of questionnaires. The study population comprised 288 management staff, and the entire population was included in the study because of its relatively small size. Of the 288 questionnaires administered, 248 were returned and correctly completed. The data were presented and analysed using a Likert scale, while the hypotheses were tested using the Pearson product-moment correlation coefficient (r). The findings indicated that technology adoption had a significant positive relationship with output ($r = 0.770$, $p < 0.05$). Similarly, customer experience had a significant positive relationship with increased revenue generation among food, beverage, and tobacco manufacturing firms in Enugu State ($r = 0.826$, $p < 0.05$). The study concluded that technological infrastructure and customer experience had significant positive relationships with output and revenue generation, respectively, among food, beverage, and tobacco manufacturing firms in Enugu State, Nigeria. Based on these findings, the study recommended, among other measures, that food, beverage, and tobacco manufacturing firms should implement automated production lines and robotic systems to improve operational efficiency, reduce human error, and enhance consistency in food and beverage processing.

Keywords: Customer experience, digital transformation, output, performance, revenue generation, technological infrastructure.

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Introduction

The concept of digital transformation has roots that trace back to early industrial automation, but its contemporary connotation driven by digital technologies, connectivity, data analytics and new business models has emerged over the past decade. Historically, manufacturing firms moved from mechanization (first and second industrial revolutions) to computerisation (third industrial revolution) and now to cyber-physical systems and digital networks (often labelled “Industry 4.0”). Digital transformation in Food & Beverages refers to the adoption and integration of digital technologies (such as IoT, cloud, AI, data-analytics and blockchain) into all parts of a company’s value-chain from procurement and production to distribution, sales and customer engagement with the aim of changing how the business operates and delivers value to customers (Nugroho et al.2023).

On a global level, digital transformation has been shown to enhance manufacturing firm performance. The Chinese manufacturing firms noted that digital investment significantly improved firm performance, particularly via cost-reduction empowerment and innovation empowerment (Ding, 2022). Moreover, in the global food and beverage sector, research by IDC across multiple regions found that companies undertaking digital transformation recorded average revenue and profit increases of 5.6 % in the prior year, compared to only around 1.2 % and 1.6 % for firms not investing in digital initiatives. (Quality Assurance & Food Safety, 2024) Another broader study lists that among food-manufacturing firms: 72 % increased digital investment in the past year; 65 % report improved operational efficiency; 71 % reported waste reductions via digital process controls (World Metrics, 2024). These global findings underscore the promise and relevance of digital transformation for manufacturing performance.

Turning to the national (Nigerian) context, Nigeria has begun to mobilise digital initiatives in the agricultural and food-value chain sectors. The Food and Agriculture Organization (FAO) together with the Nigerian government launched the “Digital Village Initiative” and the Nigeria Agri-Innovation and Digital Agriculture Platform to digitise agricultural value chains, improve data capture and reduce post-harvest losses (Food and Agriculture Organization (FAO), 2024) Meanwhile, in the Nigerian food products manufacturing sector, a recent study demonstrated that digital innovation (cloud computing, AI, IoT) had a significant relationship with sales volume growth and sales revenue growth among food-products manufacturing SMEs (Eze & Nnaji, 2023). These national initiatives and studies suggest that digital transformation is gaining traction in Nigeria’s food and beverage manufacturing space, and that performance gains may be realised.

At the local level of Enugu State, in South-East Nigeria, the food and beverage manufacturing sub-sector is subject to operational challenges such as waste reduction, customer service output and resource-management practices. Waste reduction and customer service were significantly positively related to corporate performance among food & beverage manufacturing firms in Enugu State (Okeke & Nnamani, 2022). The repurposing of a major manufacturing facility in Enugu (by Nigerian Bottling Company) into a logistics and distribution hub illustrates practical transformation efforts at the local level aiming at better efficiency and value.(BizWatch Nigeria. (2024). The performance of food and beverage manufacturing firms refers to how well these firms achieve key outcomes such as output (production volume), profitability, cost-control, resource use, employee productivity, safety/quality, waste reduction, and responsiveness to customers & environment.

Statement of the Problem

Ideally, food and beverage manufacturing firms in Enugu State should leverage digital transformation technologies such as automation, data analytics, cloud systems, and digital supply-chain management to enhance efficiency, productivity, quality control, and profitability**. Through digital adoption, firms can achieve real-time monitoring, improved customer responsiveness, cost reduction, and better decision-making, thereby ensuring competitiveness in both local and global markets.

However, many food and beverage firms in Enugu State still operate with manual or semi-automated systems, outdated production technologies, and fragmented information systems. There is low digital adoption due to high implementation costs, lack of technical expertise, poor infrastructure, and management resistance to change. Consequently, these firms face challenges such as low production efficiency, limited market visibility, high waste levels, poor traceability, and weak responsiveness to consumer demands. This technological gap has created a performance disparity between digitally advanced firms and traditional manufacturers within the same industry.

If digital transformation is not effectively adopted, food and beverage firms in Enugu State risk declining competitiveness, reduced profitability, and inability to meet regulatory and customer expectations. Over time, this could lead to loss of market share, operational inefficiencies, and eventual business failure, undermining the state's industrial growth and employment generation potential. Therefore, addressing digital transformation challenges is vital to improving firm performance and sustaining the growth of the food and beverage manufacturing sector in Enugu State.

Objectives of the study

The main objective of the study was to Digital transformation and Performance of food and beverage manufacturing firms in Enugu state. The specific objectives are to:

- i. Examine the relationship between Technology Adoptions and output of food and beverage manufacturing firms in Enugu State
- ii. Evaluate the relationship between Customer Experience and increased revenue generation of food and beverage manufacturing firms in Enugu State

Research Questions

The research questions guided the study

- i. What is the relationship between Technology infrastructure and output of food and beverage manufacturing firms in Enugu State
- ii. What is the relationship between Customer Experience and increased revenue generation of food and beverage manufacturing firms in Enugu State

Statement of Hypotheses

The following hypotheses guided the study

- i. Technology infrastructure has relationship with output of food and beverage manufacturing firms in Enugu State
- ii. Customer Experience has relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State

Scope of the Study

The scope of the study was on digital transformation and performance of food and beverage manufacturing firms in Enugu state. The study focused on technology infrastructure and customer experience as independent variables of digital transformation while output and increased revenue generation as dependent variables of performance in food and beverage manufacturing firms in Enugu State

Review of Related Literature

Conceptual Review

Digital Transformation

Digital transformation refers to the strategic process through which organizations integrate digital technologies into all facets of their operations, fundamentally altering how they create value, engage customers, and compete in their markets. As defined by Moore & Pratt (2023), it involves the “incorporation of computer-based technologies into an organization’s products, processes and strategies” so that it can better serve its workforce and customers. (Riedl et al., 2024).

In today’s context, the concept has evolved further: it is no longer purely about migrating from analogue to digital systems, but rather about fostering agile, data-driven ecosystems, leveraging technologies such as artificial intelligence (AI), Internet of Things (IoT), cloud computing and analytics to enable new business models and customer-centric experiences. (Adama & Okeke, 2024). In essence, digital transformation is a holistic journey encompassing people, processes, technology and culture through which organizations reposition themselves to thrive in the digital era.

Component of Digital transformation

Technology infrastructure

Technology infrastructure refers to the integrated framework of hardware, software, networks and services that provides the foundational platform enabling an organisation’s digital operations, communication, data storage/processing and delivery of IT services. (Qiu et al., 2023). Digital infrastructure is the foundation for the development of digital technologies, providing the necessary production materials for the development of the digital economy and new types of productivity”(Muciaccia & Tedeschi, 2023).

Customer Experience

Customer experience refers to the overall perception a customer has of a business based on interactions across various touch points. It includes factors such as service quality, ease of use, and emotional connection, all of which influence customer satisfaction and loyalty (Lemon & Verhoef, 2018). Businesses enhance customer experience by personalizing services, improving response times, and leveraging technology like AI-driven chatbots and data analytics. A positive customer experience leads to higher retention rates and brand advocacy, while a poor experience can drive customers away (Parasuraman et al., 2020).

Performance

Performance refers to the efficiency and effectiveness with which individuals or organizations achieve their goals and fulfill their responsibilities. In the workplace, employee performance is often measured by productivity, quality of work, and adherence to organizational standards (Aguinis, 2019). Poor performance can lead to decreased

organizational success, lower employee morale, and financial losses. Employers must implement effective management strategies, provide training, and create a supportive work environment to enhance overall performance (DeNisi & Murphy, 2021).

Component of Performance

Output

Output refers to the measurable results or products generated from a process, system, or individual effort. In a business or industrial setting, output is often assessed in terms of quantity, quality, and efficiency (Kaplan & Norton, 2019). High output is typically linked to effective resource utilization, well-structured workflows, and employee productivity. Factors such as automation, technology integration, and strategic management significantly impact output levels (Drucker, 2020). A decline in output may indicate inefficiencies, skill gaps, or resource constraints. Organizations must regularly evaluate and optimize their processes to maintain consistent and high-quality output (Porter, 2021).

Increased revenue generation

Increased revenue generation refers to the ability of a business or organization to enhance its income through various strategies such as expanding customer base, improving product offerings, optimizing pricing, and leveraging digital marketing (Kotler & Keller, 2019). Businesses achieve higher revenue by focusing on customer retention, innovation, and operational efficiency. Effective sales strategies, strong branding, and data-driven decision-making play a crucial role in sustaining growth and profitability (Grant, 2020). Challenges such as market competition, economic fluctuations, and changing consumer behavior can impact revenue generation. Organizations must continuously adapt and implement strategic plans to maximize financial performance (Porter, 2021).

Theoretical Framework

The following theories guided the study: The Dynamic Capabilities Theory, proposed by David J. Teece, and The Diffusion of Innovation Theory, by Everett M. Rogers in 1962

Dynamic Capabilities Theory

The Dynamic Capabilities Theory, proposed by David J. Teece, Gary Pisano, and Amy Shuen in 1997, The Dynamic Capabilities Theory suggests that organizations need to develop dynamic capabilities, which are defined as the ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Teece, 2007). This perspective shifts the focus from merely possessing valuable resources to actively developing and renewing organizational capabilities in response to environmental changes.

At its core, the Dynamic Capabilities Theory proposes that sustainable competitive advantage in dynamic markets stems from an organization's capacity to continuously create, extend, update, protect, and keep relevant its unique asset bases (Teece, 2007). This theory is particularly relevant in the context of digital transformation, where technological advancements and market disruptions are constant. For food and beverage firms navigating the complexities of digital transformation, the Dynamic Capabilities Theory suggests that success lies not just in adopting digital technologies, but in developing the organizational capabilities to effectively leverage these technologies and adapt to the changing business landscape (Warner & Wäger, 2019).

Diffusion of Innovation Theory

The Diffusion of Innovation Theory (DOI) was developed by sociologist Everett Rogers in 1962 and it explains how, why, and at what rate new ideas and technology spread through cultures. The theory highlights the process by which an innovation is communicated over time among the participants in a social system, and it is structured around five key elements: the innovation, the communication channels, the time it takes to diffuse, the social system, and the individual adopter categories.

Implications for food and beverages firms

Understanding the diffusion process can help food and beverages companies design effective marketing strategies. By identifying which group of adopters to target (e.g., innovators or early adopters), firms can tailor their promotional efforts accordingly. For example, educating key opinion leaders (KOLs) and early adopters can create a ripple effect, accelerating the adoption of a new drug. Sales teams often focus on early adopters, who can influence the adoption of the drug in broader circles, especially if they are well-respected.

The study anchored on the Dynamic Capabilities Theory because it provides a comprehensive framework for understanding how food and beverage firms can develop the necessary capabilities to effectively leverage digital technologies and adapt to the changing business environment

Empirical Review

The relationship between Technology Adoptions and Output

Idowu et al. (2017) conducted a study on technological capability and firm efficiency of selected food and beverages manufacturing companies. The study adopted a survey research design. The data was analyzed using linear regression analysis. Findings revealed technological capability had significant effect on firm efficiency. The adoption of technological capability is critical for the efficiency of manufacturing companies. Establishment and adequate investment in research and development activities and adequate use of experts will help in constantly outperforming competitors.

Olom and Odunay (2022) conducted a study on technological capability and strategic flexibility of food and beverage manufacturing companies. The study adopted a cross sectional survey research design. Primary data was collected using a 5-point Likert scaled questionnaire. The hypotheses were tested using the Spearman's Rank Order Correlation Coefficient. The tests were carried out at 0.05 level of significance. The findings revealed that there is a strong positive relationship between technological capability and strategic flexibility of food and beverage manufacturing companies in Rivers State, Nigeria.

Telukdaria et al (2023) conducted a study on Technological Advancement in the Food and Beverage Manufacturing Industry in South Africa. The food and beverage (FOODBEV) manufacturing industry is a significant contributor to global economic development, but it is also subject to major global competition. Manufacturing technology evolution is rapid and, with the Fourth Industrial Revolution (4IR), ever accelerating. Thus, the ability of companies to review and identify appropriate, beneficial technologies and forecast the skills required is a challenge. 4IR technologies, as a collection of tools to assist technological advancement in the manufacturing sector, are essential.

The vast and diverse global technology knowledge base, together with the complexities associated with screening in technologies and the lack of appropriate enablement skills, makes technology selection and implementation a challenge. This challenge is premised on the knowledge that there are vast amounts of information available on various research databases and web search engines; however, the extraction of specific and relevant information is time-intensive. Whilst existing techniques such as conventional bibliometric analysis are available, there is a need for dynamic approaches that optimise the ability to acquire the relevant information or knowledge within a short period with minimum effort.

Hassoun et al (2024) conducted a study on unveiling the relationship between food unit operations and food industry. key findings that showcase how these technologies can streamline processes, minimize waste, and improve food product quality. The adoption of Industry 4.0 innovations is increasingly reshaping the way food is prepared, transformed, preserved, packaged, and transported to the final consumer. The work provides a valuable roadmap for various sectors within agriculture and food industries, promoting the adoption of Industry 4.0 solutions to enhance efficiency, quality, and sustainability throughout the entire food supply chain.

Jang Ha-Won et al (2024) conducted a study on blockchain adoption in the food and beverage industry from a behavioral reasoning perspective: moderating roles of supply chain partnerships.. This study's Data were collected from F&B managers by using an online survey method. A structural equation modeling and multi-group analysis were performed to test the hypothesized relationships. Findings revealed that the positive effects of "reasons for" on "attitudes," and "adoption intentions" while "reasons against" did not show such effects. Environmental benefits of blockchains were found to lead more positive attitudes while traditional barriers were the greatest constraints for adopting blockchains.

Customer Experience and increased revenue generation

Nwulu (2018) conducted a study on, customer service management and marketing performance of food and beverage manufacturing firms in Nigeria. The design is the cross-sectional survey and data is generated from fifteen (15) quoted manufacturing firms in the country. Relationships are assessed based on null hypothetical statements which examine the insignificance of the effect of customer service management on three measures of marketing performance: sales growth, market share and profitability; using the Spearman's rank order correlation. All hypotheses were rejected based on the evidence of significant associations between the variables. The study, in line with its findings affirmed that customer service management contributes significantly to marketing performance thereby enhancing measures such as sales growth, market share and profitability of food and beverage firms in the Nigerian manufacturing industry.

Sudiyono et al (2022) conducted a study on this study aims to study the effect of customer experience and value on customer loyalty and satisfaction in B2B industry which researchers limitedly discussed. Data were analyzed using PLS-SEM (Partial Least Square – Structural Equation Model. The result shows that customer experience significantly affects customer value, loyalty, and satisfaction. Customer value significantly affects customer loyalty but is not significant to customer satisfaction.

Pachau and Kumar (2023) conducted a study on customer relationship management, an analysis on the practices of food and grocery retail establishments. Wilcoxon Signed Rank Test, Pearson's Correlation and Spearman's Correlation. The findings of the study highlights the practices of retail establishments that is actually communicated and perceived to be effective by the customers as well as those which proves to be ineffective and not communicated well enough by the retailers.

Khuong et al (2024) conducted a study on the impact of food reviewers on purchase intention in the food and beverage industry, the mediating role of user interaction. Findings indicate that food reviewers positively impact both user interaction and purchase intention, with three key factors emerging: reviewer reputation, video content, and video quality. However, the reviewers' expertise showed no significant effect on engagement or purchase intention. User engagement was also found to mediate the relationship between food reviewers and purchase intention, underscoring connections within the value chain linking food reviewers, user engagement, and purchase intention.

Pires et al (2024) conducted a study A Conceptual Approach to Understanding the Customer Experience in E-Commerce: An Empirical Study. Aimed to identify the constructs related to customer experience that underpins e-commerce, as well as their interconnections, to develop a comprehensive conceptual model based on theories-in-use. A quantitative approach was employed through a survey of 441 respondents. Data analysis was conducted using partial least squares structural equation modeling. The research findings revealed that there are a total of 11 constructs: customer experience, customer satisfaction, customer loyalty, word-of-mouth, trust, perceived risk, security and privacy, web content, perceived price, perceived value, and service quality.

Gap in Empirical Review

The studies done were carried outside digital transformation and performance of food and beverage manufacturing firms in Enugu state and did not focus to best of my knowledge on the Technology Adoptions and output; Customer Experience and increased revenue generation of food and beverage manufacturing firms in Enugu State. Most of the studies reviewed analysed their data through A purposeful sampling technique, Descriptive statistics and appropriate inferential statistics, Purposive Sampling technique, Pearson Moment Correlation Coefficient, Multiple sampling technique, Partial Least Square Structural Equation Modeling (PLS-SEM), while the present study made use of Z test to test the hypotheses. Therefore, the study aimed at filling this research gap by evaluating the Digital transformation and Performance of food and beverage manufacturing firms in Enugu state.

Methodology

Research Design

The descriptive sample survey was employed as the researcher's strategy for answering research questions using empirical data. It is a research design where a sample of population or item is chosen and data collected, analyzed and reported based on the sample.

Area of the study

The area of the study was Enugu State, Nigeria. The food and beverage firm understudy includes; Bons West Africa Ltd. Km 2 Enugu/Onitsha Exp. Road, Trans-Ekulu; CWAY Nigeria, Onitsha/ Enugu Production Co. Ltd; Ibeabuchi Nig. Ltd, No.3 Umuofele Pocket Layout 9th mile Corner Ngwo; Aqua Ralpa Investment, 9th mile Corner Ngwo; Nigerian Breweries Plc, 9th Mile Corner, Enugu. These organizations were chosen due the number of staff and ethical standard.

Sources of Data

Sources of data for the empirical study were primary and secondary sources.

Primary Sources

The primary data was collected through the use of structured questionnaire administered on the respondents.

Secondary Data

The researcher's secondary data were obtained from many sources, including literature, industry surveys, compilations from computerized databases and information systems, computerized or mathematical models of environmental processes and other established sources (textbooks, journals internet, websites, internal records).

Population of the Study

The population of the study consists of five (5) selected food and beverage firms for the study. The total population for the study was two hundred and sixty five (265). (See table for population distribution. For ease of questionnaire administration and proximity, the regional offices of these selected banks were used for the collection of data.

Table 1 Population of the firms understudy

S/N	Names of the Banks	Staff	Percent
1	Bons West Africa	162	22
2	CWAY Nigeria	144	15
3	Ibeabuchi Nig	137	13
4	Aqua Ralpa Investment	1 68	23
5	Nigerian Breweries Plc	177	27
Total		788	100

Source: Human Resources Department of the selected food and beverage firms in February 2025

Sample Size Determination

To determine the adequate sample size, the study used Freund and William's statistical formula as quoted by (Uzoagulu, 2009).

$$n = \frac{Z^2 N(pq)}{N(e)^2 + Z^2(pq)}$$

Where n = Sample Size

N = The population

p = Probability of success/proportion

q = Probability of failure/proportion

Z = Standard (error of mean) normal deviate

e = Limit of tolerable error (or level of significance)

N = 788

$$\begin{aligned}
 p &= .5 \\
 q &= (1 - .5) = .5 \\
 Z &= 95 \text{ percent} = 1.96 \\
 e &= 0.05 \text{ percent} \\
 &= \frac{(1.96)^2 \times 788 \times .5 \times .5}{788(0.05)^2 + (1.96)^2 \times .5 \times .5} \\
 &= \frac{3.8416 \times 788 \times .25}{1.97 + 3.8416 \times .25} \\
 &= \frac{756.795}{2.93} = 258.291 \approx \underline{258}
 \end{aligned}$$

Bowley's (1976) proportional allocation formula for stratified sampling was used to allocate the samples:

$$n_h = \frac{n(N_h)}{N}$$

Where:

Nh = Group population from each stratum

n = overall sample size

N = the overall population

nh = sample size from each stratum, in this case each state.

Table 2 Computation/Allocation of Sample Size

	Organisations	Population	Calculation	Sample	
1.	Bons West Africa	162	$\frac{162 \times 258}{788} =$	53	11
2.	CWAY Nigeria	144	$\frac{144 \times 258}{788} =$	47	13
3.	Ibeabuchi Nig	137	$\frac{137 \times 258}{788} =$	45	10
4.	Aqua Ralpa Investment	1 68	$\frac{168 \times 258}{788} =$	55	7
5.	Nigerian Breweries Plc	177	$\frac{177 \times 258}{788} =$	58	9
	Total	788		258	100

Source: Field Survey, 2025

Instrument for Data Collection

Given the objectives and the nature of the study, the study made use of questionnaire administration. The questionnaires were designed and administered on the selected respondents. The responses generated were used thereafter for data analysis.

Validity of the Instrument

The instrument was given to two experts from the industry and academia to measure face and content validity. To make sure that the research instruments applied in the work are valid, the research ensured that the instrument measure the concept they are supposed to measure.

Reliability of the Instrument

A test method of reliability was adopted for the study in which 10 copies of the questionnaire were distributed to other five (5) selected food and beverage firms; five copies to each food and beverage firm. The outcome was subjected to consistency test using Chronbach's Alpha Coefficient testing tool.

The formula is as follows:

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	10	100.0
	Excluded	0	0
	Total	10	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	No. of Items
.84	10

Scale reliabilities were calculated using Cronbach's Alpha; the result obtained was 0.84. This shows that the internal consistency of the scale is good for the purpose of this study because it is 0.84 which was good.

Methods of Data Analysis

Data were collected, coded, grouped into frequencies, and arranged into tables for ease of reference. Data from the questionnaire were collected and analyzed using simple percentages and mean. To determine the nature and strength of relationship between the research variables, Z – test was used to test the hypotheses with aid of Special Package for Statistical Software (SPSS). For the 5-point likert scale questions, the scale and decision rule stated below was used in analysing the findings.

Scale

Strongly Agree (SA)	-	5
Agree (A)		4
Neutral (N)	-	3
Disagree (D)	-	2
Strongly Disagree (SD)	-	1

Decision Rule: If Mean > 3.0, the respondents agree and If mean $\leq$ 3.0, the respondents disagree

Data Presentation, Analysis and Interpretation of Data

Distribution and Return of Questionnaire.

The section presents and analyzes the data collected for the study. The presentation and interpretation of data were based on the questionnaire administrated to the staff of the organisation under study.

Table 3 Distribution and Return of the Questionnaire

Hotels	Distributed	No Returned	percent	No not Returned	Percent
1. Bons West Africa	53	51	20	2	1
2. CWAY Nigeria	47	45	18	2	1
3. Ibeabuchi Nig	45	44	17	1	-
4. Aqua Ralpha Investment	55	53	20	2	1
5. Nigerian Breweries Plc	58	55	21	3	1
Total	258	248	96	10	4.0

Source: Field Survey, 2025

Two hundred and fifty eight (258) copies of the questionnaire were distributed to the respondents and two hundred and forty eight (248) copies were returned representing ninety six (96) percent, while ten (10) copies of the questionnaire were not returned representing four (4) percent. That showed a high rate of response.

Data Presentation

The relationship between Technology infrastructure and output of food and beverage manufacturing firms in Enugu State

Table 4: Responses on the relationship between Technology infrastructure and output of food and beverage manufacturing firms in Enugu State

		5 SA	4 A	3 N	2 DA	1 SD	ΣFX	- X	SD	Decision
1	A strong technology infrastructure enhances production efficiency by enabling automation, real-time monitoring, and seamless coordination across manufacturing processes	545 109 44.0	340 85 34.3	72 24 9.7	30 15 6.0	15 15 6.0	1002 248 100.0	4.04	1.152	Agree
2	Advanced digital tools such as IoT sensors and cloud-based systems improve output quality by ensuring precision, reducing errors, and maintaining consistent product standards.	670 134 54.0	176 44 17.7	60 20 8.1	28 14 5.6	36 36 14.5	970 248 100.0	3.91	1.468	Agree
3	Reliable technology infrastructure facilitates faster decision-making through data analytics, leading to optimized resource utilization and higher production volumes.	570 114 46.0	176 44 17.7	162 54 21.8	28 14 5.6	22 22 8.9	958 248 100.0	3.86	1.300	Agree
4	Well-integrated IT systems strengthen supply-chain visibility and coordination, reducing downtime and increasing overall manufacturing throughput	590 118 47.6	292 73 29.4	60 20 8.1	18 9 3.6	28 28 11.3	988 248 100.0	3.98	1.313	Agree
5	Investment in modern technology infrastructure empowers food and beverage firms to innovate, expand production capacity, and respond swiftly to changing consumer demands thereby boosting total output.	690 138 55.6	208 52 21.0	36 12 4.8	14 7 2.8	39 39 15.7	987 248 100.0	3.98	1.463	Agree
Total Grand mean and standard deviation								3.954	1.3392	

Source: Field Survey, 2025

Table 4, 194 respondents out of 248 representing 78.3 percent agreed that A strong technology infrastructure enhances production efficiency by enabling automation, real-time monitoring, and seamless coordination across manufacturing processes with the mean score of 4.04 and standard deviation of 1.152. 178 respondents representing 71.7 percent agreed that Advanced digital tools such as IoT sensors and cloud-based systems improve output quality by ensuring precision, reducing errors, and maintaining consistent product standards. with a mean score of 3.91 and standard deviation of 1.468. 158 respondents representing 63.7 Percent agreed that with . Reliable technology infrastructure facilitates faster decision-making through data analytics, leading to optimized resource utilization and higher production volumes with mean score of 3.86 and standard deviation of 1.300. 191 respondents representing 77.0 percent agreed that Well-integrated IT systems strengthen supply-chain visibility and

coordination, reducing downtime and increasing overall manufacturing throughput with mean score of 3.98 and standard deviation of 1.313. 190 respondents representing 76.6 percent agreed Investment in modern technology infrastructure empowers food and beverage firms to innovate, expand production capacity, and respond swiftly to changing consumer demands — thereby boosting total output with a mean score of 3.98 and standard deviation 1.463.

The relationship between Customer Experience and increased revenue generation of food and beverage manufacturing firms in Enugu State

Table 5: Responses on the relationship between Customer Experience and increased revenue generation of food and beverage manufacturing firms in Enugu State

		5 SA	4 A	3 N	2 DA	1 SD	ΣFX	- X	SD	Decision
1	A positive customer experience results in satisfied customers who are more likely to repeat purchases	435 87 35.1	324 81 32.7	36 12 4.8	60 30 12.1	38 38 15.3	893 248 100.0	3.60	1.453	Agree
2	Focusing on CX leads firms to improve their internal processes, from manufacturing efficiency to delivery and customer service	490 98 39.5	356 89 35.9	36 12 4.8	10 5 2.0	44 44 17.7	936 248 100.0	3.77	1.442	Agree
3	Companies that focus on customer experience can gather valuable data on consumer preferences and behaviors	610 122 49.2	424 106 42.7	36 12 4.8	4 2 .8	6 6 2.4	1080 248 100.0	4.35	.817	Agree
4	Customers who have an emotional connection with a brand, often built through shared values, are more likely to remain loyal and increased revenue.	550 110 44.4	492 123 49.6	21 7 2.8	12 6 2.4	2 2 .8	1077 248 100.0	4.34	.725	Agree
5	For food and beverage firms with an online presence, a seamless digital experience can significantly influence sales.	485 97 39.1	424 106 42.7	21 7 2.8	54 27 10.9	11 11 4.4	995 248 100.0	4.01	1.122	Agree
Total Grand mean and standard deviation								4.014	1.1118	

Source: Field Survey, 2025

Table 5, 168 respondents out of 248 representing 67.8 percent agreed that a positive customer experience results in satisfied customers who are more likely to repeat purchases with the mean score of 3.60 and standard deviation of 1.453. 187 respondents representing 75.4 percent agreed that Focusing on CX leads firms to improve their internal processes, from manufacturing efficiency to delivery and customer service with a mean score of 3.77 and standard deviation of 1.442. 228 respondents representing 91.9 Percent agreed that Companies that focus on customer experience can gather valuable data on consumer preferences and behaviors with mean score of 4.35 and standard deviation of .817. 233 respondents representing 94.0 percent agreed that Customers who have an emotional connection with a brand, often built through shared values, are more likely to remain loyal and increased revenue with mean score of 4.34 and standard deviation of .725. 203 respondents representing 81.8 percent agreed for food and beverage firms with an online presence, a seamless digital experience can significantly influence sales, such as changes in student schedules or health concerns, with a mean score of 3.93 and standard deviation 1.463.

Test of Hypotheses

Hypothesis One: Technology infrastructure has relationship with output of food and beverage manufacturing firms in Enugu State

Correlations						
	A strong technology infrastructure enhances production efficiency by enabling automation, real-time monitoring, and seamless coordination across manufacturing processes	Advanced digital tools such as IoT sensors and cloud-based systems improve output quality by ensuring precision, reducing errors, and maintaining consistent product standards	With the adoption of tracking technologies like blockchain, consumers can know the origins of their food products, which lead to higher sales, thus impacting output positively.	Reliable technology infrastructure facilitates faster decision-making through data analytics, leading to optimized resource utilization and higher production volumes	Investment in modern technology infrastructure empowers food and beverage firms to innovate, expand production capacity, and respond swiftly to changing consumer demands — thereby boosting total output.	
A strong technology infrastructure enhances production efficiency by enabling automation, real-time monitoring, and seamless coordination across manufacturing processes	Pearson Correlation Sig. (2-tailed) N	1 .402** 248	.402** .000 248	.401** .000 248	.630** .000 248	.123 .053 248
Advanced digital tools such as IoT sensors and cloud-based systems improve output quality by ensuring precision, reducing errors, and maintaining consistent product standards	Pearson Correlation Sig. (2-tailed) N	.402** .000 248	1 .000 248	.388** .000 248	.485** .000 248	.774** .000 248
Reliable technology infrastructure facilitates faster decision-making through data analytics, leading to optimized resource utilization and higher production volumes.	Pearson Correlation Sig. (2-tailed) N	.401** .000 248	.388** .000 248	1 .000 248	.656** .000 248	.371** .000 248
Many food and beverage manufacturing firms have adopted energy-efficient technologies , which lowers operational costs	Pearson Correlation Sig. (2-tailed) N	.630** .000 248	.485** .000 248	.656** .000 248	1 .000 248	.463** .000 248
Investment in modern technology infrastructure empowers food and beverage firms to innovate, expand production capacity, and respond swiftly to changing consumer demands — thereby boosting total output.	Pearson Correlation Sig. (2-tailed) N	.123 .053 248	.774** .000 248	.371** .000 248	.463** .000 248	1 .000 248

** . Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation matrix on the Technology infrastructure has relationship with output of food and beverage manufacturing firms in Enugu State showing the correlation coefficients, significant values and the number of cases. The correlation coefficient shows 0.774. This value indicates that correlation is significant at 0.05 level (2 tailed) and implies that there is a relationship between Technology infrastructure and output of food and beverage manufacturing firms ($r=.774$). The computed correlations coefficient is greater than the table value of $r = .000$ with 879 degree of freedom ($df. = n - 2$) at alpha level for a two-tailed test ($r=.77, p<.05$).

Decision Rule

The decision rule is to accept the null hypothesis if the computed r is less than the tabulated r otherwise reject the null hypothesis.

Decision

Since the computed $r = 0.77$ is greater than the table value of $.000$, we reject the null hypothesis. Therefore, we conclude that Technology Adoptions had significant positive relationship with output of food and beverage manufacturing firms in Enugu State, Nigeria as reported in the probability value of ($r=.77, p<.05$).

Hypothesis Two: Customer Experience has relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State

Correlations					
	A positive customer experience results in satisfied customers who are more likely to repeat purchases	Focusing on CX leads firms to improve their internal processes, from manufacturing efficiency to delivery and customer service	Companies that focus on customer experience can gather valuable data on consumer preferences and behaviors	Customers who have an emotional connection with a brand, often built through shared values, are more likely to remain loyal and increased revenue.	For food and beverage firms with an online presence, a seamless digital experience can significantly influence sales.
A positive customer experience results in satisfied customers who are more likely to repeat purchases	1	.712**	.365**	.357**	.222**
		.000	.000	.000	.000
	248	248	248	248	248
Focusing on CX leads firms to improve their internal processes, from manufacturing efficiency to delivery and customer service	.712**	1	.529**	.605**	.127*
	.000		.000	.000	.046
	248	248	248	248	248
Companies that focus on customer experience can gather valuable data on consumer preferences and behaviors	.365**	.529**	1	.826**	.238**
	.000	.000		.000	.000
	248	248	248	248	248
Customers who have an emotional connection with a brand, often built through shared values, are more likely to remain loyal and increased revenue.	.357**	.605**	.826**	1	.169**
	.000	.000	.000		.008
	248	248	248	248	248
For food and beverage firms with an online presence, a seamless digital experience can significantly influence sales.	.222**	.127*	.238**	.169**	1
	.000	.046	.000	.008	
	248	248	248	248	248

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The Pearson correlation matrix on the: Customer Experience has relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State showing the correlation coefficients, significant values and the number of cases. The correlation coefficient shows 0.826. This value indicates that correlation is significant at 0.05 level (2 tailed) and implies that: Customer Experience had significant positive relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State ($r=0.826$). The computed correlations coefficient is greater than the table value of $r = .000$ with 879 degree of freedom ($df. = n - 2$) at alpha level for a two-tailed test ($r=0.826, p<.05$).

Decision Rule

The decision rule is to accept the null hypothesis if the computed r is less than the tabulated r otherwise reject the null hypothesis.

Decision

Since the computed $r = 0.826$ is greater than the table value of $.000$, we reject the null hypothesis. Therefore, we conclude that customer experience had significant positive relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State as reported in the probability value of ($r=0.826, p<.05$).

Discussion of Findings

Technology infrastructure has relationship with output of food and beverage manufacturing firms in Enugu State

From the result of hypothesis one, computed $r = 0.77$ was greater than the table value of $.000$, we concluded that Technology infrastructure had significant positive relationship with output of food and beverage manufacturing firms in Enugu State, Nigeria. In the support of the result in the literature review, Hassoun et al (2024), conducted a study on unveiling the relationship between food unit operations and food industry. The key findings that showcase how these technologies can streamline processes, minimize waste, and improve food product quality. Olom and Odunay (2022), conducted a study on technological capability and strategic flexibility of food and beverage manufacturing companies. The findings revealed that there is a strong positive relationship between technological capability and strategic flexibility of food and beverage manufacturing companies in Rivers State, Nigeria. The study therefore concludes that technological capability significantly and positively predicts strategic flexibility of food and beverage companies in Rivers State.

Customer Experience has relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State

From the result of hypothesis two, the computed $r = 0.826$ was greater than the table value of $.000$, we concluded that Customer Experience had significant positive relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State. In the support of the result in the literature review, Khuong et al (2024), conducted a study on the impact of food reviewers on purchase intention in the food and beverage industry, the mediating role of user interaction. Findings indicate that food reviewers positively impact both user interaction and purchase intention, with three key factors emerging: reviewer reputation, video content, and video quality. Pires et al (2024), conducted a study A Conceptual Approach to Understanding the Customer Experience in E-

Commerce: An Empirical Study. The research findings revealed that there are a total of 11 constructs: customer experience, customer satisfaction, customer loyalty, word-of-mouth, trust, perceived risk, security and privacy, web content, perceived price, perceived value, and service quality.

Summary of Findings, Conclusion and Recommendations

Summary of Findings

- i. Technology infrastructure had significant positive relationship with output of food and beverage manufacturing firms in Enugu State, Nigeria, $r (.77, P. < .05)$. This indicates that technology adoptions promotes output of the firms under study.
- ii. Customer Experience had significant positive relationship with increased revenue generation of food and beverage manufacturing firms in Enugu State, $r (.826, P. < .05)$. This implies that customer experience enhances revenue generation of the firms understudy.

Conclusion

The study concluded that Technology infrastructure and Customer Experience had significant positive relationship with output and revenue generation of food and beverage manufacturing firms in Enugu State, Nigeria. Digital transformation significantly impacts the performance of food and beverage manufacturing firms by improving efficiency, productivity, and competitiveness. Key aspects include automation, data analytics, Internet of Things (IoT), artificial intelligence (AI), and cloud computing. These technologies enhance production processes, supply chain management, quality control, and customer engagement. Automation and AI reduce manual processes, minimizing errors and increasing speed.

Recommendations

The following recommendations are proposed:

- i. Food and beverage manufacturing firms should implement robotic systems to improve efficiency, reduce human errors, and enhance consistency in food and beverage processing.
- ii. There are needs to Utilize social media, email marketing, and direct customer feedback channels to build relationships and brand loyalty and actively engage with customers through promotions, contests, and behind-the-scenes content.

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