

PREDICTIVE VALIDITY OF BUSINESS INTELLIGENCE, DIGITAL TRANSFORMATION, AND CUSTOMER ENGAGEMENT ON CUSTOMER LOYALTY IN LAGOS STATE, NIGERIA

Adeyemi, Omolade Sunday

Christopher University, Ogun State, Nigeria
Adeyemimld@gmail.com

Adeyemi, Oluwatoyin Damilola

Aletheia University, Ogun State, Nigeria
Oluwatoyin.adeyemi@aletheiauniversity.edu.ng

Adeyemi, Kayode Samuel

Oduduwa University, Osun State, Nigeria
amkayodeadeyemi@gmail.com

Aderibigbe, Ademola Segun

Joseph Ayo Babalola University, Ekiti State,
Nigeria
asaderibigbe@jabu.edu.ng

Nnorom, Goodluck Kelechi

Caleb University, Lagos State, Nigeria
goodluckhanks@gmail.com

Corresponding Author:

Adeyemi, Omolade Sunday

Christopher University, Ogun State, Nigeria
Adeyemimld@gmail.com

DOI: <https://doi.org/10.69713/uoaaj2025v03i02.09>

Abstract

In the digitally driven consumer market, this study looks at how business intelligence, digital transformation, and customer engagement relate to one another and how they affect customer loyalty. The purpose of the study is to examine the predictive validity of business intelligence, digital transformation, and customer engagement on customer loyalty. The quantitative cross-sectional survey research design was adopted for the study. Three hundred and eighty (380) participants from a range of sectors, including e-commerce, digital services, telecommunications, and finance in Lagos State, Nigeria, were invited to fill out a structured closed-ended questionnaire. The formula developed by Krejcie and Morgan (1970) was used to determine the sample size. The stratified random sampling technique was used in order to guarantee equitable representation across various industries. A structured, closed-ended online survey with a 5-point Likert scale measure was used to collect data. Following a pilot study with 30 respondents, Cronbach's alpha (≥ 0.70) was obtained for the reliability of the instrument. The relevance and strength of the associations between the variables were assessed in the study using regression and correlation analysis. The results show that business intelligence and digital transformation have a statistically significant effect on customer loyalty, while customer engagement does not. The study found that businesses that employ data analytics, automation, and AI-driven insights had higher rates of customer retention than those that solely rely on engagement strategies. The study recommends that businesses should prioritize digital transformation and business intelligence in order to boost customer loyalty.

Keywords: Business Intelligence, Digital Transformation, Customer Engagement, Customer Loyalty, Corporate Strategy

INTRODUCTION

In this current digital economy, businesses are increasingly relying on data-driven strategies to improve decision-making and maintain a competitive edge. Business intelligence (BI), has become a crucial tool for companies seeking to analyze large amounts of data, identify market trends, and develop strategies that improve customer engagement and retention. Businesses must include business intelligence (BI) in their corporate strategy in order to successfully meet customer expectations and foster long-lasting loyalty, as digital technology is changing consumer behaviour (Yang and Lee, 2022). Businesses that integrate business intelligence (BI) into their strategic planning can enhance customer experiences, increase operational effectiveness, and foster sustainable growth.

Despite the increased focus on business intelligence (BI), little is understood about how it directly affects consumer loyalty and corporate strategy, especially in digitally driven industries. Most prior research has been on how BI can enhance organizational performance (Anjaningrum et al., 2024) and facilitate digital transformation (Omol et al., 2024). Research on how companies might use BI data to develop strategic goals that improve customer retention is, nevertheless, lacking. Furthermore, emerging countries, where digital consumer behaviour is changing quickly, have received less attention in the majority of the research now available on developed economies.

This study attempts to fill these gaps by examining the extent to which businesses use BI in their strategic planning to increase customer loyalty. Previous research has highlighted the benefits of BI adoption in general corporate operations (Haque et al., 2023), but its role in developing customer-oriented strategies has received less attention. Given the increasing competition in digital markets and the ease with which customers can

switch brands, businesses need to employ advanced business intelligence (BI) methodologies to understand consumer preferences and develop strategies that create lasting partnerships (Mastuti et al., 2024). However, the purpose of this study is to examine the impact of business intelligence, corporate strategy on customer loyalty in a digitally driven consumer market.

Statement of the Problem

Despite the fact that business intelligence is now an essential part of corporate decision-making, many businesses still have trouble converting data insights into strategies that increase customer loyalty. Despite prior research demonstrating a favourable relationship between BI and business success, there is currently a dearth of empirical data on the direct effects of BI-driven activities on customer retention in digital markets (Raffey et al., 2024). As businesses continue their digital transformation, it is critical to comprehend the extent to which business intelligence (BI) influences strategic decision-making and customer loyalty, particularly in highly competitive and rapidly evolving industries (Giang et al., 2024).

This study attempts to bridge this gap by investigating the relationship between BI, business strategy, and customer loyalty. It will examine how companies use business intelligence (BI) technologies to develop strategic goals that boost customer satisfaction, foster trust, and promote ongoing engagement. Given the increasing importance of customized consumer experiences and the high rate of customer churn in digital marketplaces, it is imperative to understand how BI can foster loyalty. In the long run, the research's findings will help businesses thrive and keep customers by providing practical guidance on how to use BI for strategic decision-making.

LITERATURE REVIEW

Conceptual Review

Business Intelligence and Corporate Strategy

Business Intelligence and corporate strategy refer to the collection, analysis, and presentation of corporate data methods, tools, and technologies that are used to assist in decision-making. According to Chen and Prentice (2024), businesses can use business intelligence (BI) to gain insights from large amounts of data, enhance strategic planning, and increase operational efficiency. According to Khaing (2024), BICS systems enable businesses to better monitor consumer preferences and market trends by integrating internal and external data sources.

Scholars have differing opinions about the function of BICS in organizations. Some claim that the main way business intelligence (BI) gives companies a competitive edge is by assisting them in making data-driven decisions that boost output (Judijanto, 2024). Others argue that organisational culture and data literacy are essential elements of BICS's effectiveness, since companies without a data-driven mindset may struggle to use BI successfully (Al Daabseh et al., 2024). Additionally, Mekimah et al. (2024) point out that although BI improves decision-making, its efficacy depends on the calibre and applicability of the data gathered.

Most scholars agree that BICS is used differently in different sectors. For instance, BI is used in retail for inventory optimization and customer behaviour research, and it supports patient data management and predictive analytics in the healthcare sector (Omol et al., 2024). Even though business intelligence (BI) is widely acknowledged to have a significant impact on company performance, its efficacy depends on a variety of elements, including data quality, managerial support, and technological

infrastructure (Gurcan et al., 2023; Mmeje et al., 2024).

Customer Loyalty

Customer loyalty (CL) is the commitment of a customer to continue using a service or purchasing a product despite the availability of alternative options. Myftaraj and Trebicka (2023) define CL as a combination of behavioural and attitudinal loyalty in which customers have a strong emotional connection with a brand in addition to consistently buying from it. There are differing opinions regarding the elements that affect customer loyalty. Price and product quality are the primary determinants of loyalty, according to some scholars (Madueke and Eyupoglu, 2024). Others emphasize the importance of consumer experience, emotional connection, and brand engagement (Yang and Lee, 2022).

Whether or not customer loyalty is eroding in the digital age is a major topic of discussion in CL literature. According to some research, growing market rivalry and the availability of substitutes are making customers less devoted (Sani et al., 2024). Nonetheless, other scholars contend that loyalty programs, tailored experiences, and digital engagement strategies can still foster a high level of customer loyalty (Kucklick et al., 2020; Sutrisno et al., 2024). Despite varying opinions, academics largely concur that CL is essential for company success since devoted customers increase repeat business, lower marketing expenses, and act as brand ambassadors (Amajuoyi et al., 2024). To maintain customer loyalty in the digital age, companies must constantly innovate, customize user experiences, and cultivate enduring relationships (Madueke & Eyupoglu, 2024).

THEORETICAL REVIEW

The importance of business intelligence, digital transformation, customer engagement, and customer loyalty in determining the success of

businesses in the digital economy has led to a surge of interest in these areas. According to Chen and Prentice (2024), business intelligence (BI) is the methodical application of data-driven insights to improve corporate performance and decision-making. According to Cheng (2024), digital transformation (DT) is the process of incorporating digital technologies into corporate operations in order to improve productivity and customer satisfaction. According to Giang et al. (2024), customer engagement (CE) is the degree of contact and involvement a consumer has with a brand, especially in digital contexts. According to Al Daabseh et al. (2024), these structures are essential in determining customer loyalty (CL), which is demonstrated by consumers' ongoing preference for a certain brand or service provider.

To provide a theoretical foundation for this inquiry, two significant theories are examined: the Technology Acceptance Model (TAM) and the Relationship Marketing Theory (RMT). These concepts help to explain how businesses could leverage corporate data, digital transformation, and consumer engagement strategies to foster customer loyalty in the modern marketplace.

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), explains how individuals embrace and use new technology (Akolkar, 2024). It is based on two fundamental concepts:

- The term perceived usefulness, or PU, refers to the degree to which people believe a technology will enhance their performance.
- Perceived ease of use, or PEU, is the degree to which individuals think a technology is simple to use.

This study asserts that because business intelligence and digital transformation facilitate

seamless digital experiences, boost decision-making, and enhance service efficacy, they are crucial in shaping consumer behaviour. Consumers who think digital business solutions are useful and easy to use are more likely to engage with a company and remain loyal over time (Judijanto, 2024; Madueke & Eyupoglu, 2024). Companies that utilize AI-driven recommendations, predictive analytics, and customized digital platforms tend to develop stronger relationships with their customers, which increases brand loyalty (Mekimah et al., 2024).

The Relationship Marketing Theory (RMT)

The Relationship Marketing Theory (RMT) developed by Morgan and Hunt (1994) states that trust and dedication are necessary to create long-lasting business-customer relationships (Akolkar, 2024). Transactional marketing focuses on short-term sales, but relationship marketing aims to build long-term partnerships through personalized interactions, customer service, and loyalty programs (Haque et al., 2023).

This study indicates that customer involvement is a crucial component in the relationship between digital transformation and customer loyalty. Research indicates that businesses that put a high priority on customer engagement through social media interactions, brand communities, and personalized emails generally have higher customer retention rates (Haque et al., 2023). Companies that employ digital technologies such as chatbots powered by artificial intelligence, omnichannel marketing strategies, and real-time customer feedback platforms boost engagement and create long-lasting brand loyalty (Sani et al., 2024).

Theoretical Framework

This study examines the predictive validity of business intelligence, digital transformation, and customer engagement on customer loyalty,

based on the Technology Acceptance Model (TAM) and Relationship Marketing Theory (RMT). TAM provides insights into how technology adoption influences consumer behaviour, whereas RMT highlights the importance of engagement and trust in preserving customer relationships. When taken as a whole, these concepts make it clear how businesses may strategically employ digital technology and interaction strategies to boost customer retention and brand loyalty in the dynamic consumer market.

Empirical Review

Mekimah et al. (2024) examined the evolution of business intelligence (BI) research and its impact on corporate decision-making through bibliometric analysis. The study examines 2,442 BI-related articles from Scopus (2014–2024) to identify important trends, notable authors, and research requirements. The results suggest a reduction in BI publications and a lack of integration with data mining, decision-making, competitive intelligence, and human resource management. The research highlights geographic disparities, with the United States and China leading in output. To further BI research, more interdisciplinary collaboration and exploration of uncharted territory are recommended. These findings offer valuable direction for additional study and practical organisational applications.

Al Daabseh et al. (2024) looked at the banking industry's customer-based corporate reputation as well as how perceived competence, quality, likeability, and trust impact customer loyalty and satisfaction. To evaluate reputation dynamics, data from a sizable sample of banking customers were studied using structural equation modelling using SmartPLS4. The results show that likeability is a key factor in determining consumer loyalty. The study strengthens the model's robustness by confirming its validity and dependability. While there is no explicit mention of business

intelligence (BI) technology, data-driven methods align with BI principles. The study suggests improving reputation management and service customization strategies. These results give banks important guidance on how to improve customer retention and fortify their market position.

Latief and Firman (2024). investigates how e-business strategies are affected by digital transformation, which includes social media integration, mobile commerce, and Industry 4.0 technology. It analyses changing patterns in digital commerce by synthesizing knowledge from academic papers, reports, and case studies through a methodical literature study. Results show that digital transformation boosts competitive advantage, encourages innovation, and improves customer experiences. Businesses must, nevertheless, deal with issues pertaining to data governance, talent, and infrastructure. The study highlights the need for agility and strategic adaptation in reacting to market upheavals. It emphasizes the significance of innovation in maintaining success in the digital economy and offers useful insights for companies looking to maximize their digital strategies.

Yang and Lee (2022) investigate how digital consumer experience and loyalty in mobile e-commerce are shaped by mobile short-form video (MSFV) shopping. It investigates the effects of stickiness, relationship quality, and content quality on attitudinal and behavioural loyalty using a human–computer interaction paradigm. According to an analysis of 778 responses from a survey of 796 MSFV app users in China, customer stickiness is greatly increased by the strength of the relationships and content. Stickiness also acts as a mediator in the connection between these elements and customer loyalty. The report emphasizes how crucial MSFV applications are for building enduring customer connections and offers managerial advice on how to best utilize their

potential to promote sustainable growth in mobile commerce through improved customer engagement.

Owuor and Njeru (2018) look at how marketing strategies in Nairobi's big supermarkets are affected by business intelligence (BI) technologies. Businesses produce enormous amounts of transactional data as a result of globalization and growing rivalry, which can yield strategic insights when properly examined. The study used structured questionnaires to survey five supermarkets using a descriptive cross-sectional methodology. Descriptive statistics and logistic regression were used to analyze the data. The results showed that BI technology was not widely used; however, some factors had a big impact on marketing strategies. Supermarkets used market basket analysis and data warehousing for segmentation, even though they had limited access to customer data. The report calls for more research in other service sectors and advises broadening the use of BI and data sources to improve marketing strategies.

Ndubuisi-Okolo et al. (2025) looked at how artificial intelligence (AI) impacts the sustainability and operational efficacy of SMEs in Southeast Nigeria, with a focus on machine learning. A descriptive study design was used, with a focus on 27,546 SMEs that are registered with the Corporate Affairs Commission. Using the formula Krejcie and Morgan (1970) devised, a sample size of 379 was selected. Data was collected using validated structured questionnaires with a reliability rating of 0.86. A simple regression analysis revealed that machine learning significantly improved SMEs' operating efficiency. The research emphasizes AI's revolutionary potential and urges policymakers to support its uptake through financing, instruction, and regulatory support. More SME environments outside of Southeast Nigeria should be covered in future research.

Duong et al. (2024) investigated the relationship between trust factors and consumer purchase intentions as they translate from e-stores to live-streaming platforms. The study, which was based on the trust transfer theory, polled 200 people and used bootstrapping techniques to analyze the data using SmartPLS 4.0. The results showed that confidence in live-streaming channels is highly influenced by the trust characteristics of e-stores, namely integrity, kindness, ability, and predictability. Purchase intentions are also strongly impacted by live streaming's regularity and honesty, while e-stores' skill and kindness are also quite important. With its theoretical contributions to understanding trust dynamics in digital commerce and its practical insights for improving consumer trust in live-stream buying, the study highlights the disparate effects of trust across e-commerce platforms.

Myftaraj and Trebicka (2023) looked into how loyalty card programs affect customer behaviour in Albania's retail sector. A survey was given to a diverse set of customers between March and May 2023 to collect data on awareness, satisfaction, loyalty, and customized perks. Responses were analyzed to test hypotheses and address research questions. The findings demonstrate that loyalty programs are well-known and that consumer satisfaction and loyalty are significantly raised by discounts and point accumulation. Frequent card users had a considerable impact on loyalty, but other bonus groups did not. By emphasizing the need to promote loyalty programs, upgrade perks based on customer feedback, and personalize rewards to boost engagement and satisfaction, the study offers helpful insights for improving retail customer loyalty.

Mmeje et al. (2024) investigated how business intelligence (BI) affects decision-making in the telecom industry of MTN Nigeria, where competitiveness depends on data-driven insights. The study used a mixed-method

approach, combining survey methods with ex-post facto and descriptive designs. Out of the 1,495 people in the population, 316 respondents were chosen by random and stratified sampling and given a structured questionnaire. BI has a considerable impact on decision-making, but its effects vary depending on the component, according to data analysis utilizing descriptive statistics and structural equation modelling (SEM). Service, processing, and risk decisions are greatly impacted by BI cost, data quality, security, and technical know-how. The study suggests increased technical proficiency, better data protection, and purposeful BI investments to maximize performance and decision-making.

Giang et al. (2024) examine the relationship between customer empowerment and involvement on sharing platforms in the retail sector, with service innovation and consumer trust serving as mediators. A quantitative application of a well-established theoretical framework was made. Data collected from 457 users of retail-sharing platforms was analyzed using partial least squares-structural equation modelling (PLS-SEM). The findings demonstrate that consumer empowerment significantly raises engagement both directly and through service innovation, acting as a mediator. However, platform trust does not act as a mediator in this connection. As to the report, retailers may enhance consumer involvement by promoting service innovation through empowerment. A conceptual framework is proposed to enhance customer involvement in the sharing economy through service innovation.

METHODOLOGY

This study adopts a quantitative research approach to examine the predictive validity of business intelligence (BI), digital

transformation (DT), and customer engagement (CE) on customer loyalty (CL) in Lagos State, Nigeria. A survey-based cross-sectional study design is utilized because it allows data collection at a certain point in time and allows correlations between variables to be detected without implying causality (Saunders, Lewis, & Thornhill, 2019). The study's target audience consists of mid-to senior-level managers from digitally driven industries like e-commerce, finance, telecommunications, and digital service providers in Lagos State, Nigeria. The total population was determined to be 380 based on industry data, organisational records, and past studies on digital business intelligence and customer loyalty. The formula developed by Krejcie and Morgan (1970) was used to determine the sample size. Using the formula, a sample size of roughly 380 respondents was chosen to ensure statistical sufficiency for testing hypotheses. The technique of stratified random sampling was used to guarantee equitable representation across various industries.

A structured, closed-ended questionnaire with a 5-point Likert scale was used to measure key variables; predictive analytics and data-driven decision-making are used to assess business intelligence; digital transformation is assessed through investments in digital technologies; and trust, retention, and repeat business are used to assess customer loyalty. Online surveys covering demographics, digital transformation, loyalty, and business intelligence usage were used to collect data; Cronbach's alpha (≥ 0.70) was used to evaluate reliability; a multiple regression model was used to determine how independent variables affect customer loyalty; a pilot study with 30 respondents ensured reliability; and factor analysis was used to confirm measurement validity.

RESULT

Demographic Information

The demographic information of the respondents provides insight into the distribution of respondents based on important factors such as age, gender, industry, years of experience, and educational background. This information helps put the responses in context and comprehend the variation of the sample.

Table 1: Demographic Information of Respondents

		Frequency	Percent
Age	18-25	46	12.1
	26-35	158	41.6
	36-45	112	29.5
	46 and above	64	16.8
	Total	380	100.0
Sex	Male	184	48.4
	Female	196	51.6
	Total	380	100.0
Educational Qualification	High School	18	4.7
	Bachelor's Degree	73	19.2
	Master's Degree	200	52.6
	Doctorate Degree	89	23.4
	Total	380	100.0
Industry	E-commerce	93	24.5
	Fintech	146	38.4
	Telecommunications	70	18.4
	Digital Services	32	8.4
	Others	39	10.3
	Total	380	100.0
Year of Experience	Less than 2 years	70	18.4
	3-5 Years	145	38.2
	6-10 Years	116	30.5
	10 Years and above	49	12.9
	Total	380	100.0

Source: Research Field Survey (2025)

The age distribution indicates that 29.5% of respondents are between the ages of 36 and 45, while 41.6% of respondents are between the ages of 26 and 35. 12.1% of the sample is composed of younger respondents, those aged 18 to 25, while 16.8% is composed of respondents aged 46 and above. This suggests that a significant portion of the workforce surveyed is young to middle-aged, which may

reflect the demographics of professionals in the relevant industries.

The gender combination appears to be fairly equal, as seen by the 48.4% male and 51.6% female respondents. The survey's nearly equal representation of men and women indicates that it considered both sexes' perspectives, ensuring a more in-depth analysis of the responses.

In terms of education, the majority of respondents (52.6%) have a master's degree, while 23.4% have a PhD. Just 4.7% of the sample had just completed high school, whereas 19.2% hold a bachelor's degree. The respondents' high percentage of postgraduate degree holders indicates that they are well educated, which might affect how they feel about the topic of the study.

The fintech sector is the most represented in the industry distribution, accounting for 38.4% of the replies. E-commerce accounts for 24.5%, while telecommunications accounts for 18.4%. Digital services and other industries have respective percentages of 8.4% and 10.3%. This distribution illustrates the study's preponderance of e-commerce and fintech experts, highlighting the sectors' growing importance in the modern digital economy.

Regression Analysis

Table 2 Regression Analysis

Model	R	R Square	Adjusted Square	R Std. Error Estimate
1	.954 ^a	.910	.910	.30725
a. Predictors: (Constant), Business Intelligence, Digital Transformation, Customer Engagement				
b. Customer Loyalty				

Source: Researcher's Field Survey (2025)

The dependent variable (customer loyalty) and the independent variables (business intelligence, digital transformation, and customer engagement) have a high positive association, as indicated by the R value of 0.954. This implies that customer loyalty is significantly impacted by the predictors that were chosen.

The R Square (R²) score of 0.910 indicates that business intelligence, digital transformation, and customer engagement account for 91.0% of the variation in customer loyalty. Based on the provided independent variables, the model's

The majority of respondents (38.2%) had three to five years of professional experience, followed by those with six to ten years (30.5%). 18.4% of respondents have fewer than two years of experience, whilst 12.9% have more than ten years. This suggests that the majority of responders had a great deal of industry expertise, which can help explain their knowledgeable opinions on the predictive validity of business intelligence, digital transformation, and customer engagement on customer loyalty.

Inferential Statistics

In Table 2, the regression study evaluates the relationship between business intelligence, digital transformation, and customer engagement as predictors of customer loyalty. The model provides significant statistical metrics that help understand the significance and magnitude of these relationships.

high R² score indicates how well it explains changes in customer loyalty.

The model's robustness is further demonstrated by the Adjusted R Square value of 0.910, which accounts for the number of predictors included. The fact that the adjusted R² value remains constant at R² (0.910) suggests that the inclusion of these three independent variables does not increase noise or redundancy, further supporting the validity of the model.

The average deviation of observed values from the regression line is indicated by the standard

error of estimate (0.30725). More accuracy in the model's predictions is shown by a lower standard error. The relatively small standard

error indicates that the model fits well for predicting customer loyalty based on the criteria utilised.

Table 3. Regression showing the significance of each predictor to Customer Loyalty

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	360.368	3	120.123	1272.458	.000 ^b
	Residual	35.495	376	.094		
	Total	395.865	379			

a. Predictors: (Constant), Business Intelligence, Digital Transformation, Customer Engagement

b. Customer Loyalty

Source: Researcher's Field Survey (2025)

Table 3 shows the results of the regression analysis, which assesses the significance of customer engagement, digital transformation, and business intelligence in predicting customer loyalty. The findings provide insight into how well these independent variables complement the overall model.

variance in customer loyalty that the predictors are unable to explain is represented by the residual sum of squares (35.495). Explainable and unexplainable deviations are combined in the overall sum of squares (395.865).

In the Analysis of Variance (ANOVA) and Model Fit, the regression sum of squares (360.368) indicates the percentage of the variance in customer loyalty that can be accounted for by the three predictors: customer engagement, digital transformation, and business intelligence. The unaccounted-for

The 1272.458 F-statistic is very significant because the p-value (Sig.) is 0.000. The model is considered statistically significant when the p-value, or significance level, is less than 0.05. This shows that customer loyalty is significantly impacted by the combination of digital transformation, corporate information, and customer engagement.

Table 4: Contribution of each predictor to Customer Loyalty

Model	Unstandardized Coefficient		Standardized Coefficient Beta	T	Sig.	
	B	Std. Error				
1	(Constant)	-.104	.041		-2.522	.012
	Business Intelligence	.459	.021	.478	21.391	.000
	Digital Transformation	.536	.030	.530	17.745	.000
	Customer Engagement	.024	.025	.025	.969	.333

Source: Researcher's Field Survey (2025)

Table 4 presents the regression coefficients, which show how customer engagement, digital transformation, and business intelligence all influence the prediction of customer loyalty.

These figures help determine the relative importance and statistical significance of each predictor within the model.

The constant ($B = -0.104$, $p = 0.012$) represents the expected value of customer loyalty when all three predictors (digital transformation, business intelligence, and customer engagement) are equal to zero. Without these conditions, there would be little customer loyalty, according to the negative score.

Assuming all other variables stay the same, the unstandardized coefficient ($B = 0.459$) indicates that customer loyalty rises by 0.459 units for every unit increase in business intelligence. The standardized coefficient ($Beta = 0.478$) indicates that customer loyalty is significantly enhanced by business intelligence. According to the significance level ($p = 0.000$) and the t-value of 21.391, this variable is very important in predicting customer loyalty.

A one-unit increase in digital transformation results in a 0.536-unit increase in customer loyalty, according to the unstandardized coefficient ($B = 0.536$). Out of the three predictors, the standardized beta value (0.530) indicates that digital transformation has the biggest impact on customer loyalty. The statistical significance of digital transformation

in predicting customer loyalty is demonstrated by its t-value of 17.745 and p-value of 0.000.

The unstandardized coefficient ($B = 0.024$) indicates that for every unit increase in customer engagement, there is only a 0.024-unit increase in customer loyalty. The standardized beta value (0.025) indicates that customer involvement has a negligible impact on customer loyalty when compared to the other variables. Additionally, the t-value of 0.969 and the p-value of 0.333 suggest that consumer engagement is not a statistically significant predictor of customer loyalty. This suggests that consumer engagement in this study has no discernible impact on variations in customer loyalty.

Correlation Analysis

Table 5 shows the relationship coefficients for customer engagement (CE), digital transformation (DT), business intelligence (BI), and customer loyalty (CL). These values range from -1 to +1. The degree and direction of correlations between these variables are measured by Pearson's correlation; a positive value denotes a direct relationship, whereas a negative value suggests an inverse one.

Table 5 Correlations

		CL	BI	DT	CE
CL	Pearson Correlation Sig. (2-tailed)	1			
BI	Pearson Correlation Sig. (2-tailed)	.875** .000	1		
DT	Pearson Correlation Sig. (2-tailed)	.895** .000	.721** .000	1	
CE	Pearson Correlation Sig. (2-tailed)	.736** .000	.600** .000	.801 .000	1
Total	N	380	380	380	380

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

Source: Researcher’s Field Survey (2025)

Customer loyalty and business intelligence have a strong and positive relationship, shown by the 0.875 ($p = 0.000$) correlation. This

implies that consumer loyalty rises sharply when companies improve their intelligence

skills, including data analytics, market insights, and decision-making procedures.

A very significant positive association between customer loyalty and digital transformation is indicated by a correlation coefficient of 0.895 ($p = 0.000$). This suggests that companies that embrace digital transformation through online services, automation, and digital consumer experiences enjoy greater levels of customer loyalty.

The association between customer involvement and customer loyalty is moderately substantial, with a correlation of 0.736 ($p = 0.000$). While not as much as business intelligence and digital transformation, this suggests that customer engagement, as measured by interactions, feedback, and personalized experiences, contributes to customer loyalty.

Digital transformation and business intelligence have a substantial positive link, with a correlation of 0.721 ($p = 0.000$). This implies that businesses that use business intelligence tools have a higher chance of successfully implementing digital transformation initiatives.

A somewhat positive association between business intelligence and customer engagement is indicated by the correlation value of 0.600 ($p = 0.000$). This indicates that although business intelligence facilitates customer engagement, the relationship between it and digital transformation or customer loyalty is weaker.

Customer engagement and digital transformation have a substantial positive relationship, shown by the correlation of 0.801 ($p = 0.000$). This implies that companies that invest in digital transformation also frequently see an increase in customer involvement, most likely as a result of interactive platforms, digital channels, and tailored communications.

DISCUSSION

The findings of the regression study show that customer engagement, digital transformation, and business intelligence all have a high impact on customer loyalty. A robust model fit is indicated by the adjusted R² value of 0.910, which indicates that these three variables together account for 91% of the differences in customer loyalty.

The two factors that most affect customer loyalty are digital transformation ($\beta = 0.530$, $p = 0.000$) and business intelligence ($\beta = 0.478$, $p = 0.000$). This suggests that businesses are more likely to experience a rise in customer loyalty when they use digital technologies like data analytics, AI-driven services, and automated customer engagement. Additionally, business intelligence is essential since it allows companies to study customer behaviour and adjust their approach accordingly. Customer loyalty is not substantially predicted by customer engagement ($\beta = 0.025$, $p = 0.333$) in this study, indicating that engagement initiatives by themselves would not be enough to keep customers in the absence of digital and data-driven assistance.

These results are consistent with those of Cheng (2024), who discovered that by increasing service effectiveness and personalization, digital transformation improves customer retention in e-commerce businesses. In a similar vein, Mastuti et al. (2024) found that by enabling data-driven decision-making, business intelligence systems greatly increase customer loyalty. This viewpoint is further supported by Kouam, (2025), who highlights how digital adoption helps fintech companies improve their interactions with their customers.

These results, however, go counter to those of Amajuoyi et al. (2024), who contended that loyalty is more strongly impacted by consumer involvement than by digital transformation.

Similarly, Ndubuisi-Okolo et al. (2025), discovered that business intelligence technologies are not as important for customer retention in the hospitality industry as personalized interaction techniques. Hadhoud and Salameh (2020), added that although digital transformation increases productivity, it does not always result in increased customer loyalty unless it is paired with meaningful human engagement.

The correlation analysis shows a strong positive relationship between digital transformation ($r = 0.895$, $p = 0.000$) and customer loyalty and business intelligence ($r = 0.875$, $p = 0.000$). According to these results, businesses that employ data-driven strategies and state-of-the-art technologies tend to have greater customer retention rates. However, the relationship between customer engagement and loyalty is comparatively weaker ($r = 0.736$, $p = 0.000$), indicating that although engagement has benefits, digital transformation or business intelligence is more effective at promoting customer loyalty.

These results are in line with those of Omol et al. (2024), who highlighted the importance of digital convenience and tailored experiences while establishing a strong link between digital transformation and customer loyalty in the financial services industry. Similarly, business intelligence and customer retention are strongly correlated, according to Kwilinski et al. (2023), especially in online retail companies where data-driven insights enhance consumer satisfaction and targeting. Additionally, Al Daabseh et al. (2024) found that AI-powered digital solutions greatly increase customer loyalty, particularly in industries with a high level of digital contact.

The results, on the other hand, run counter to Raffey et al. (2024), assertion that in-person encounters are more important for retaining customers than digital solutions. According to

Anjaningrum et al. (2024), business intelligence technologies have little effect on loyalty in sectors where customers seek individualized services. Additionally, Akolkar, (2024) issued a warning that relying too much on digital transformation in the absence of effective CRM could undermine trust and lower long-term customer retention.

Contribution to Knowledge

This study contributes to the growing body of research on customer loyalty by providing empirical evidence on how customer engagement, business intelligence, and digital transformation impact customer retention strategies. This study highlights the important impact that technology-driven elements play in promoting customer loyalty, in contrast to previous studies that mostly focused on traditional marketing and engagement techniques. The findings indicate that while direct engagement strategies have historically been given more weight by businesses, business intelligence and digital transformation are now more crucial for preserving long-term customer retention.

Furthermore, this study expands on previous research by demonstrating that, contrary to some previous assumptions, consumer engagement alone doesn't significantly predict customer loyalty. This offers new viewpoints on how consumer interactions are changing in the digital era, highlighting the necessity for businesses to incorporate technological advancements and data-driven decision-making into their customer retention strategies.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study's findings show that businesses that invest in cutting-edge technology, data

analytics, and AI-driven customer insights tend to have higher levels of customer retention in order to improve customer satisfaction and long-term brand loyalty. The study also shows that while customer engagement does not have a significant standalone effect, business intelligence and digital transformation are important factors that determine customer loyalty. The study notes that while digital transformation and business intelligence have been demonstrated to be powerful predictors of customer loyalty, their effectiveness may differ based on the industry, target audience, and business environment. To provide a comprehensive customer experience, businesses must combine the use of technology with personalized human interactions.

Recommendations

In light of the results, the following recommendations were made:

1. Companies should make digital transformation a top priority by incorporating data analytics, AI, and machine learning into their marketing and customer support initiatives;
2. Businesses should use business intelligence technologies to forecast trends, examine consumer behaviour, and modify their offerings to satisfy changing consumer demands;
3. Businesses shouldn't completely give up on traditional customer engagement strategies like relationship management, tailored interactions, and customer assistance, even when digital transformation has a significant impact on customer loyalty;
4. Organizations should create sector-specific plans that are suited to the expectations and preferences of their customers, as the effects of digital transformation and business intelligence differ depending on the industry; and
5. Businesses should constantly assess and modify their customer loyalty plans in light of new developments in technology and changing consumer preferences.

REFERENCES

- Akolkar, H. R. (2024). *Examining the impact of artificial intelligence on customer satisfaction in the banking sector: a quantitative analysis* [Doctoral Dissertation]. Westcliff University.
- Al Daabseh, T. K. I., Aljawarneh, N. M., Al Smadi, K., Alnawafleh, A., Al-Maaitah, T. A., & Al-Junaidi, A. (2024). Integration of business intelligence and marketing: Enhancing corporate reputation in the financial services sector. *Journal of Infrastructure, Policy and Development*, 8(7), 1–20. <https://doi.org/10.24294/jipd.v8i7.4603>.
- Amajuoyi, C. P., Nwobodo, L. K., & Adegbola, A. E. (2024). Utilizing predictive analytics to boost customer loyalty and drive business expansion. *GSC Advanced Research and Reviews*, 19(3), 191–202. <https://doi.org/10.30574/gscarr.2024.19.3.0210>.
- Anjaningrum, W. D., Azizah, N., & Suryadi, N. (2024). Spurring SMEs' performance through business intelligence, organizational and network learning, customer value anticipation, and innovation - Empirical evidence of the creative economy sector in East Java, Indonesia. *Heliyon*, 10(2024), 1–16. <https://doi.org/10.1016/j.heliyon.2024.e27998>.
- Chen, Y., & Prentice, C. (2024). Integrating Artificial Intelligence and Customer Experience. *Australasian Marketing Journal*, 00(0), 1–13.

- <https://doi.org/10.1177/14413582241252904>.
- Cheng, Y. (2024). Digital Transformation of China's E-Commerce Industry. *Advances in Economics, Management and Political Sciences*, 105(1), 72–78. <https://doi.org/10.54254/2754-1169/105/20241937>.
- Duong, N. T., Lin, H. H., Wu, T. L., & Wang, Y. S. (2024). Understanding Consumer Trust Dynamics and Purchase Intentions in a Multichannel Live Streaming E-Commerce Context: A Trust Transfer Perspective. *International Journal of Human-Computer Interaction*, 1–15. <https://doi.org/10.1080/10447318.2024.2423332>.
- Giang, H. T. T., Dung, L. T., Tien, H. T., & Nhu, C. T. B. (2024). Customer empowerment and engagement on sharing platforms in the retailing sector: testing the mediating effects of service innovation and platform trust. *Journal of Innovation and Entrepreneurship*, 13(1), 1–21. <https://doi.org/10.1186/s13731-024-00431-2>.
- Gurcan, F., Ayaz, A., Menekse Dalveren, G. G., & Derawi, M. (2023). Business Intelligence Strategies, Best Practices, and Latest Trends: Analysis of Scientometric Data from 2003 to 2023 Using Machine Learning. *Sustainability (Switzerland)*, 15(13), 1–23. <https://doi.org/10.3390/su15139854>.
- Hadhoud, R., & Salameh, W. A. (2020). How business intelligence can help you better understand your customers. *International Journal of Business Intelligence Research*, 11(1), 50–58. <https://doi.org/10.4018/IJBIR.2020010104>.
- Haque, M. A., Zhang, X., Akanda, A. K. M. E. A., Hasan, M. N., Islam, M. M., Saha, A., Hossain, M. I., & Rahman, Z. (2023). Knowledge Sharing among Students in Social Media: The Mediating Role of Family and Technology Supports in the Academic Development Nexus in an Emerging Country. *Sustainability (Switzerland)*, 15(13), 1–27. <https://doi.org/10.3390/su15139983>.
- Judijanto, L. (2024). Bibliometric Insights into the Development of Real-Time Business Intelligence Systems. *The Eastasouth Journal of Information Systems and Computer Science*, 2(01), 1–14. <https://doi.org/10.58812/esiscs.v2i01>.
- Khaing, H. H. (2024). *The effect of business intelligence on organizational agility and the competitive advantage of City Properties Co., Ltd.* [MBA thesis]. Yangon University of Economics.
- Kouam, A. W. F. (2025). Toward Digital Transformation: Insights into Chinese Cross-Border E-Commerce SMEs During the COVID-19 Pandemic and the Post-Pandemic Era. *Sage Open*, 15(1), 1–19. <https://doi.org/10.1177/21582440251318792>.
- Kucklick, J.-P., Kamm, M. R., Schneider, J., and Vom Brocke, J. (2020). *Extending Loyalty Programs with BI Functionalities: A Case Study for Brick-and-Mortar Stores*. 168–177. <https://hdl.handle.net/10125/63761>
- Kwilinski, A., Trushkina, N., Birca, I., & Shkrygun, Y. (2023). Organizational and Economic Mechanism of Customer Relationship Management under the Era of Digital Transformations. *E3S Web of Conferences*, 456, 1–20. <https://doi.org/10.1051/e3sconf/202345605002>
- Latief, F., & Firman, A. (2024). Evolving E-Business: Trends and Strategies for Digital Transformation in the Digital Age. *The Journal of Business and Management Research*, 6(2), 119–133. <https://doi.org/10.55098/tjbmr.v6i2.664>
- Madueke, C. J., & Eyupoglu, S. (2024). Sustaining Economic Growth: E-Service Quality's Role in Fostering Customer

- Loyalty in Nigeria SMEs. *Sustainability (Switzerland)*, 16(21). <https://doi.org/10.3390/su16219175>
- Mastuti, D. N., Sofiati, N. A., Suhendra, A., Prayoga, R., & Arianty, K. P. (2024). Digital Business Ecosystem: Strategy, Technology, E-Commerce, and Consumer Analysis. *SIJDB*, 2(1), 89–103. <https://doi.org/10.38035/sijdb.v2i2>
- Mekimah, S., Zighed, R., Mili, K., & Bengana, I. (2024). Business intelligence in organizational decision-making: a bibliometric analysis of research trends and gaps (2014–2024). *Discover Sustainability*, 5(1), 1–18. <https://doi.org/10.1007/s43621-024-00692-7>
- Mmeje, D. U., Hur-Yagba, A. A., & Rauf, R. I. (2024). Leveraging Business Intelligence for Strategic Decision Making: Analyzing Its Impact on MTN Nigeria's Organizational Performance. *Journal of Human Resource and Sustainability Studies*, 12(04), 780–802. <https://doi.org/10.4236/jhrss.2024.124041>
- Myftaraj, E., & Trebicka, B. (2023). Analyzing the impact of loyalty card programs on customer behavior: insights from the Albanian market. *F1000 Research*, 12(1028), 1–29. <https://doi.org/10.12688/f1000research.138185.1>
- Ndubuisi-Okolo, P. U., Onyinye, M. E., & Iheanyi, O. A. (2025). The impact of artificial intelligence on the sustainability and operational efficiency of small and medium-scale businesses in South-East, Nigeria. *European Journal of Research and Reflection in Management Sciences*, 13(1), 1–13. www.idpublications.org
- Omol, E., Mburu, L., & Abuonji, P. (2024). Unlocking Digital Transformation: The Pivotal Role of Data Analytics and Business Intelligence Strategies. *International Journal of Knowledge Content Development & Technology*, 14(3), 77–91. <https://doi.org/10.5865/IJKCT.2024.14.3.077>
- Owuor, E. O., & Njeru, W. (2018). Business Intelligence Technology and Marketing Strategy in the Retail Sector. *Advances in Social Sciences Research Journal*, 5(11), 1–26. <https://doi.org/10.14738/assrj.511.5438>
- Raffey, M. A., Daud, M. A., Gaikwad, S. B., Yeul, S. J., Pawar, S. U., & Khan, R. B. A. (2024). Leveraging Business Intelligence: Analyzing Its Impact On Customer Base Growth and Retention. *Educational Administration: Theory and Practice*, 30(6), 4495–4498. <https://doi.org/10.53555/kuey.v30i6.7532>
- Sani, I., Utami, S., & Sayidah, N. (2024). Literature Review: Digital Marketing: Increasing Consumer Growth and Loyalty. *Journal of Economics, Management, Entrepreneur, and Business*, 4(2), 302–315. <https://doi.org/10.52909/jemeb.v4i2.201>
- Sutrisno, S., Ausat, A. M. A., & Muhamad, L. F. (2024). Effective Social Media Content Strategy to Enhance Brand Loyalty in Technology Businesses. *MALCOM: Indonesian Journal of Machine Learning and Computer Science*, 4(4), 1261–1266. <https://doi.org/10.57152/malcom.v4i4.1416>
- Yang, Q., & Lee, Y. C. (2022). What Drives the Digital Customer Experience and Customer Loyalty in Mobile Short-Form Video Shopping? Evidence from Douyin (TikTok). *Sustainability (Switzerland)*, 14(17), 1–19. <https://doi.org/10.3390/su141710890>