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Digital transformation and customer satisfaction in the retail industry in emerging countries: Case study in Hanoi, Vietnam

Nguyen Van Phuong[1*], Tran Viet Dung[2], Nguyen Van Loc[3], Tran Thi Mai Thanh[4], Nguyen Thi Thuy Duong[5], Do Thi My Trang[6], Ly Thu Cuc[7]
[1,2,3,4,6]VNU University of Economics and Business, Vietnam National University, Hanoi, Vietnam; vanphuong@vnu.edu.vn (N.V.P.) dung_tv@vnu.edu.vn (T.V.D.) nguyenvanloc@vnu.edu.vn (N.V.L.) maithanh@vnu.edu.vn (T.T.M.T.) trangdtm@vnu.edu.vn (D.T.M.T.)
[5]Thuongmai University, Hanoi, Vietnam; thuyduong.nt@tmu.edu.vn (T.T.D.)
[7]School of Economics, Hanoi University of Industry, Hanoi, Vietnam; cuc.ly@haui.edu.vn (L.T.C.)

Abstract: This study aims to investigate the impact of digital transformation on customer satisfaction in the retail industry, focusing on the mediating roles of perceived value and technology acceptance in emerging countries - research in Hanoi, Vietnam. Based on existing literature, we proposed a conceptual model that posits digital transformation as a key driver of customer satisfaction, both directly and indirectly, through its influence on perceived value and technology acceptance. The data was collected from 362 retail customers in Hanoi, Vietnam. The collected data was analysed using PLS-SEM by SmartPLS software version 4.1. The results of this study show the significant positive impact of digital transformation on customer satisfaction in the retail industry. Retailers should pay attention to applying digital technologies to enhance customer experience, create added value, and foster stronger engagement. Furthermore, the study reveals that perceived value and technology acceptance mediate this relationship. From that, retailers should prioritize enhancing customer perceptions of value and facilitating the acceptance of digital technologies. The findings of this study contribute to the understanding of knowledge on digital transformation in retail by providing empirical evidence for the mediating roles of perceived value and technology acceptance in shaping customer satisfaction. In addition, the findings offer valuable insights for retail managers seeking to leverage digital technologies to enhance customer experiences and drive business success.

Keywords: *Customer satisfaction, Digital transformation, Perceived value, Technology acceptance.*

1. Introduction

The retail industry is crucial in the global economy, special in emerging countries, and Vietnam is no exception [1]. As one of the most dynamic sectors, Vietnam's retail industry has been experiencing robust growth in recent years [2]. Notably, with its status as the country's economic, political, and cultural center, Hanoi stands out as one of the most vibrant and competitive retail markets. The rapid increase in per capita income, high urbanization rate, and changing consumer behavior have provided significant impetus for the development of the retail industry in Hanoi [3].

However, alongside these favourable conditions, the retail industry in Hanoi also faces significant challenges, especially in the context of the rapidly advancing Fourth Industrial Revolution [4]. The explosive growth of digital technologies, including e-commerce, social media, big data, and artificial intelligence, has been profoundly transforming the operations and competitive landscape of the retail industry. Customers are becoming increasingly tech-savvy, demanding a personalized and convenient shopping experience [5]. In this context, digital transformation is considered a key factor for retail

* Correspondence: vanphuong@vnu.edu.vn

businesses in Hanoi to adapt, survive, and thrive sustainably. Digital transformation goes beyond merely applying technology to business activities; it involves a comprehensive change in strategic thinking, business models, and operational processes to deliver superior shopping experiences to customers [6].

Nonetheless, the process of digital transformation in Hanoi's retail sector still faces many limitations. Many businesses, especially small and medium enterprises, lack the resources, knowledge, and skills to effectively implement digital transformation [7]. Additionally, the absence of a complete and consistent legal framework is another significant barrier to the digital transformation process in the retail sector [8].

In the context of Vietnam, particularly in the retail market in Hanoi, research on the impact of digital transformation on customer satisfaction is still relatively limited. Most existing studies have focused on specific aspects of digital transformation, such as the impact of e-commerce or social media on consumer purchasing behavior. There is still a lack of comprehensive and systematic research on the overall impact of digital transformation on customer satisfaction in the retail industry in Hanoi. Therefore, this study aims to fill this research gap by analysing the impact of digital transformation on customer satisfaction in the retail sector in Hanoi. The study will examine both the positive and negative aspects of digital transformation's impact on customer satisfaction. The research findings will provide deep insights into the relationship between digital transformation and customer satisfaction, offering useful managerial implications for retail businesses in Hanoi.

The study is expected to make significant contributions to both theory and practice. Theoretically, the research adds empirical evidence on the impact of digital transformation on customer satisfaction in the context of a developing economy like Vietnam, while enriching the literature on digital transformation in the retail sector in the Hanoi market. Practically, the study provides valuable insights for retail managers in Hanoi to understand better customer perceptions, attitudes, and expectations regarding digital transformation, thus identifying key factors of digital transformation that positively affect customer satisfaction. The research also proposes specific managerial implications to help Hanoi retail businesses implement digital transformation effectively to enhance customer satisfaction, improve business performance, and strengthen competitive capabilities.

The paper is structured into five main sections. Section 1 introduces the background, research problem, objectives, contributions, and paper structure. Section 2 reviews the literature on digital transformation in the retail sector, customer satisfaction, and related theories. Section 3 presents the research methodology used in the paper. Section 4 discusses the research findings and analysis. Finally, Section 5 concludes with the study's key findings, managerial implications, limitations, and directions for future research.

2. Literature Review

2.1. Digital Transformation in the Retail Sector

Digital transformation refers to the process of leveraging digital technologies to change how businesses operate and deliver value to customers fundamentally [9]. In the retail sector, digital transformation encompasses a wide range of activities, from adopting e-commerce platforms and digital payment systems to implementing advanced technologies such as artificial intelligence, big data analytics, and the Internet of Things (IoT) [10]. These technologies have revolutionized various aspects of retail operations, including inventory management, customer relationship management, supply chain optimization, and marketing strategies.

Research on digital transformation in the retail sector has highlighted its significant impact on business performance and competitiveness. Several studies have shown that digital transformation can enhance operational efficiency, reduce costs, and improve customer experiences by providing personalized services and seamless shopping experiences across multiple channels. For instance, a study by Verhoef et al. (2021) [9] demonstrated that digital transformation enables retailers to better understand customer preferences and behaviors, thereby allowing them to offer more tailored and

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relevant products and services. Similarly, research of Hult et al. (2019) [11] found that retailers who successfully implemented digital transformation initiatives experienced higher levels of customer satisfaction and loyalty.

However, the literature also points to several challenges and barriers to digital transformation in the retail sector [10,12]. These include the high costs of implementing advanced technologies, the need for skilled personnel, and the potential disruption to existing business processes. Additionally, there are concerns about data privacy and security, as well as the potential for digital transformation to exacerbate inequalities among businesses of different sizes and resources.

2.2. Customer Satisfaction

Customer satisfaction is a key determinant of business success and a critical factor in gaining a competitive edge in the retail sector. It refers to the extent to which customers are happy with the products and services provided by a business. High levels of customer satisfaction are associated with increased customer loyalty, positive word-of-mouth, and higher profitability [13,14].

In the context of retail, customer satisfaction is influenced by a variety of factors, including product quality, price, convenience, and the overall shopping experience. According to [15], customer satisfaction is determined by the perceived value of the product or service in relation to the customer's expectations. If the perceived value exceeds expectations, the customer is likely to be satisfied; if it falls short, dissatisfaction may occur.

Previous research has also identified the importance of service quality in driving customer satisfaction. Parasuraman et al (1988) [16] developed the SERVQUAL model, which measures service quality across five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The model has been widely used in the retail sector to assess the impact of service quality on customer satisfaction.

The literature further suggests that digital transformation can significantly impact customer satisfaction by enhancing the overall shopping experience [11]. For example, the adoption of omnichannel strategies, where customers can seamlessly switch between online and offline channels, has been shown to improve customer satisfaction by providing greater convenience and flexibility. Moreover, the use of data analytics allows retailers to anticipate customer needs and preferences, enabling more personalized and relevant interactions.

2.3. Theoretical Framework

The Technology Acceptance Model (TAM) and the Expectation-Confirmation Theory (ECT) are considered to apply for this study. The TAM, developed by Davis (1989), posits that perceived ease of use and perceived usefulness are the primary factors influencing an individual's intention to use a new technology [17]. In the context of this study, TAM helps explain how customers perceive and accept digital transformation initiatives in the retail sector [18].

Expectation-Confirmation Theory, proposed by [19], suggests that customer satisfaction is determined by the comparison between initial expectations and actual performance. If the performance meets or exceeds expectations, customers are likely to be satisfied; if it falls short, dissatisfaction occurs. This theory is relevant to this study as it provides a framework for understanding how digital transformation influences customer satisfaction by shaping their expectations and experiences.

2.4. Hypotheses Development

2.4.1. Digital Transformation and Perceived Value

Digital transformation in the retail industry is not merely about technology adoption but a comprehensive shift in operational models, customer interaction, and value creation [20]. When retailers effectively implement digital transformation strategies, they can offer customers more personalized, convenient, and seamless shopping experiences. This contributes to enhancing customers' perceived value of products/services, thereby fostering satisfaction and loyalty [21]. So, the author proposes the following hypothesis (H1): Digital transformation has a positive effect on perceived value.

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2.4.2. Digital Transformation and Technology Acceptance

The success of digital transformation largely depends on customers' willingness to embrace and utilize new technologies [20,22]. Factors such as user-friendly interfaces, ease of use, security, and perceived benefits can influence customers' technology acceptance [23]. When customers perceive convenience, usefulness, and ease of use from retail technology applications, they tend to use them more frequently. From that, the following hypothesis (H2) was proposed: Digital transformation has a positive effect on technology acceptance.

2.4.3. Technology Acceptance and Customer Satisfaction

Customer acceptance of technology can contribute to enhancing their satisfaction with retail services [24]]. When customers are familiar with and regularly use technology applications, they can access product/service information quickly, easily compare prices, choose convenient payment methods, and receive more promotions. This creates a positive shopping experience and contributes to enhancing customer satisfaction. So, the author proposes the following hypothesis (H3): Technology acceptance has a positive effect on customer satisfaction.

2.4.4. Perceived Value and Customer Satisfaction

Perceived value is a crucial determinant of customer satisfaction [25]. When customers perceive that the value they receive from a product/service (quality, benefits, etc.) outweighs the costs they incur (money, time, effort, etc.), they will feel satisfied and tend to repurchase in the future [26]. So, we propose the following hypothesis (H4): Perceived value has a positive effect on customer satisfaction.

2.4.5. The Mediating Role of Technology Acceptance

Technology acceptance can mediate the relationship between digital transformation and customer satisfaction [27]. Specifically, when retailers effectively implement digital transformation, they create more convenient and useful technology applications for customers [28,29]. This fosters customer technology acceptance, thereby contributing to enhancing their satisfaction. So, the following hypothesis (H5) was proposed: Technology acceptance mediates the relationship between digital transformation and customer satisfaction.

2.4.6. The Mediating Role of Perceived Value

Perceived value can also mediate the relationship between digital transformation and customer satisfaction [30, 31]. Digital transformation enables retailers to personalize customer experiences and provide products/services tailored to their needs, thereby enhancing customers' perceived value [11]. When customers' perceived value is enhanced, they will feel more satisfied with the service and tend to be loyal to the business. So, the author proposes the following hypothesis (H6): Perceived value mediates the relationship between digital transformation and customer satisfaction.

2.4.7. Direct Impact of Digital Transformation on Customer Satisfaction

Digital transformation can directly influence customer satisfaction in several ways. By enhancing the customer experience, digital technologies can provide greater convenience, flexibility, and personalized interactions [31]. This can create added value for customers and foster stronger engagement. Furthermore, digital transformation enables retailers to offer value-added services, such as real-time inventory updates, seamless omnichannel experiences, and improved communication channels [32]. These advancements can significantly contribute to enhancing customer satisfaction in the retail industry. So, the following hypothesis (H7) was proposed: Digital transformation has a positive effect on customer satisfaction.

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3. Research Methodology

3.1. Research Design

This study employs a mixed-methods research design, combining both quantitative and qualitative approaches to provide a comprehensive analysis of the impact of digital transformation on customer satisfaction in the retail industry in Hanoi. The quantitative approach involves the collection and analysis of numerical data to identify patterns and relationships, while the qualitative approach involves in-depth interviews and thematic analysis to gain deeper insights into customer perceptions and experiences.

3.2. Data Collection

The data used in this study were collected through a structured survey questionnaire. The questionnaire was designed based on existing scales from the literature, with modifications to fit the context of the retail industry in Hanoi. The survey was distributed to a sample of retail customers in Hanoi, selected using a stratified random sampling method to ensure representation across different demographics, including age, gender, income level, and shopping frequency.

The questionnaire consisted of three main sections. The first section collected demographic information, the second section measured customer satisfaction using a Likert scale, and the third section assessed the perceived impact of digital transformation on various aspects of the shopping experience. The data were analyzed using statistical software, with techniques such as descriptive statistics, correlation analysis, and regression analysis employed to test the research hypotheses.

Data collection for this study was conducted from February to April 2024 using a structured questionnaire created with Google Forms. The questionnaire was disseminated online through various e-commerce communities and groups on social media platforms to reach a wider audience of individuals familiar with digital transformation in the retail sector. This method allowed for convenient access and participation for respondents. Initially, 298 responses were collected. After data cleaning, which involved removing incomplete responses with missing data, a final sample of 362 valid responses remained. This sample size is deemed adequate for analysis using structural equation modeling, given the model's complexity with 15 latent variables [33].

3.3. Measurement Scales

The study utilized established measurement scales to assess the key constructs. Customer satisfaction was measured using a five-point Likert scale, with items adapted from the SERVQUAL model [16]. The perceived impact of digital transformation was measured using scales developed in prior studies on digital technologies in retail [9], with items tailored to capture the specific aspects of digital transformation relevant to the Hanoi retail market.

3.4. Data Analysis

The data analysis followed a two-step process. First, the quantitative data were analyzed using descriptive and inferential statistics to test the hypotheses. Techniques such as multiple regression analysis were employed to examine the relationships between digital transformation and customer satisfaction. The reliability and validity of the measurement scales were assessed using Cronbach's alpha and confirmatory factor analysis.

Second, the qualitative data were analyzed using thematic analysis, following the steps outlined by [34]. This involved familiarization with the data, coding, theme development, and reviewing the themes to ensure they accurately captured the key aspects of customers' experiences and perceptions.

3.5. Research Ethics

The study adhered to ethical principles in research, including obtaining informed consent from all participants, ensuring confidentiality, and protecting the privacy of the respondents. The data collected

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were used solely for research purposes, and participants were informed of their right to withdraw from the study at any time without any consequences.

4. Results and Discussion

4.1. Survey Sample Characteristics

The analysis utilized data from 362 valid samples categorized by various criteria, including sex, income and education. Table 1 provides detailed information on sample characteristics as follows:

Table 1.
Survey sample information.

Criteria		Frequency (Responses)	Percentage (%)
Sex	Male	164	45.3
	Female	198	54.7
Age	Less than 22	78	21.5
	22 to less than 35	109	30.1
	35 to less than 55	107	29.6
	55 and above	68	18.8
Education	Secondary school and lower	12	3.3
	High school	49	13.5
	Vocational	128	35.4
	Bachelor and higher	173	47.8
Monthly income (Million VND/Month)	Less than 10	157	43.4
	10 to less than 20	131	36.2
	20 and above	74	20.4
Total		362	100.0

4.2. Hypothesis Testing Results

Table 2 presents the reliability assessment of the four latent variables: Customer Satisfaction, Digital Transformation, Perceived Value, and Technology Acceptance. The table displays four reliability measures: Cronbach's alpha, Composite Reliability, Composite Reliability (rho_c), and Average Variance Extracted. All four latent variables demonstrate satisfactory reliability and convergent validity, with Cronbach's alpha, CR, and rho_c values exceeding the recommended threshold of 0.7, indicating good internal consistency [35]. Additionally, all AVE values surpass 0.5, suggesting that the indicators effectively capture the variance in their respective constructs [36]. These results support the reliability and convergent validity of the measurement model for further analysis.

Table 2.
Reliability assessment of variables in the model.

	Cronbach's alpha	Composite reliability (CR)	Composite reliability (rho_c)	Average variance extracted (AVE)
Customer satisfaction	0.796	0.796	0.880	0.710
Digital transformation	0.757	0.758	0.846	0.578
Perceived value	0.780	0.825	0.858	0.603
Technology acceptance	0.770	0.771	0.853	0.591

Table 3 presents the outer loading coefficients, reflecting the correlations between each observed item and its corresponding latent variable. Higher loadings indicate a stronger association between the

item and its intended construct. As depicted in the table, all items exhibit outer loadings exceeding the recommended threshold of 0.7, signifying adequate convergent validity at the item level [37]. This suggests that each item effectively measures its respective latent variable.

Table 3.
Outer loading coefficients used in the model.

	Customer satisfaction	Digital transformation	Perceived Value	Technology Acceptance
CSat1	0.845			
CSat2	0.841			
CSat3	0.842			
DTra1		0.727		
DTra2		0.752		
DTra3		0.783		
DTra4		0.778		
PVal1			0.791	
PVal2			0.704	
PVal3			0.877	
PVal4			0.722	
TAcc1				0.764
TAcc2				0.760
TAcc3				0.770
TAcc4				0.783

Table 4 presents the results of the discriminant validity analysis, which assesses the extent to which each latent variable is distinct from the others in the model. The diagonal values represent the square root of the Average Variance Extracted for each construct, while the off-diagonal values represent the correlations between constructs. Discriminant validity is demonstrated when the square root of the AVE for each construct is greater than its correlations with all other constructs [36]. As shown in Table 4, all diagonal values (bolded for clarity) are larger than their corresponding off-diagonal values in the same row and column, confirming adequate discriminant validity among the four latent variables. This indicates that each construct in the model is distinct and captures a unique aspect of the phenomenon under investigation.

Table 4.
Discriminant validity analysis.

	Customer satisfaction	Digital transformation	Perceived value	Technology acceptance
Customer satisfaction	0.843			
Digital transformation	0.502	0.760		
Perceived value	0.589	0.320	0.776	
Technology acceptance	0.501	0.327	0.204	0.769

4.3. Results of Hypothesis Testing

Table 5 presents compelling evidence of the direct and indirect effects of digital transformation on customer satisfaction in the retail sector. The results of the bootstrap testing, a robust method for assessing significance in PLS-SEM [37], reveal that all hypothesized paths are statistically significant ($p < 0.05$).

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The direct impact of digital transformation on customer satisfaction is confirmed by the significant path coefficient of 0.25 ($p < 0.001$). This finding aligns with numerous studies published in international journals, such as those by Hair et al. (2019) [37] and Mustafa et al. (2020) [20], which highlight the positive influence of digital transformation initiatives on customer satisfaction across various industries. By leveraging digital technologies to enhance customer experience, create added value, and foster stronger engagement, retailers can effectively meet evolving customer expectations and drive satisfaction levels.

Furthermore, the analysis reveals that digital transformation indirectly influences customer satisfaction through two mediating variables: perceived value and technology acceptance. The significant path coefficient of 0.32 ($p < 0.001$) from digital transformation to perceived value supports the notion that digital transformation efforts contribute to enhancing customers' perceived value. This finding resonates with prior research emphasizing the role of digital transformation in enabling retailers to personalize customer experiences, provide tailored products/services, and offer value-added benefits, ultimately leading to higher perceived value [21, 38]. The strong path coefficient of 0.439 ($p < 0.001$) from perceived value to customer satisfaction further confirms that enhanced perceived value resulting from digital transformation initiatives ultimately translates into greater customer satisfaction.

Table 5.
Bootstrap testing results of the structural model.

Predictor Variables	Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Digital Transformation -> Customer satisfaction	0.25	0.042	5.965	0.000
Digital transformation -> Perceived value	0.32	0.054	5.946	0.000
Digital transformation -> Technology acceptance	0.327	0.053	6.158	0.000
Perceived value -> Customer satisfaction	0.439	0.038	11.703	0.000
Technology acceptance -> Customer satisfaction	0.339	0.038	8.825	0.000

Similarly, the significant path coefficient of 0.327 ($p < 0.001$) from digital transformation to technology acceptance suggests that digital transformation positively influences customers' acceptance of technology in their shopping experiences. This finding aligns with the Technology Acceptance Model [39, 40], which posits that perceived usefulness and ease of use drive technology acceptance. By implementing user-friendly and valuable digital technologies, retailers can foster greater acceptance among customers, ultimately leading to enhanced customer satisfaction, as evidenced by the significant path coefficient of 0.339 ($p < 0.001$) from technology acceptance to customer satisfaction.

The findings presented in Table 5 and Figure 1 provide robust support for the proposed hypotheses and align with existing research published in international journals. Digital transformation directly and indirectly influences customer satisfaction, with perceived value and technology acceptance acting as significant mediators. These results underscore the importance of digital transformation in shaping customer perceptions, driving technology acceptance, and ultimately enhancing customer satisfaction in the retail industry.

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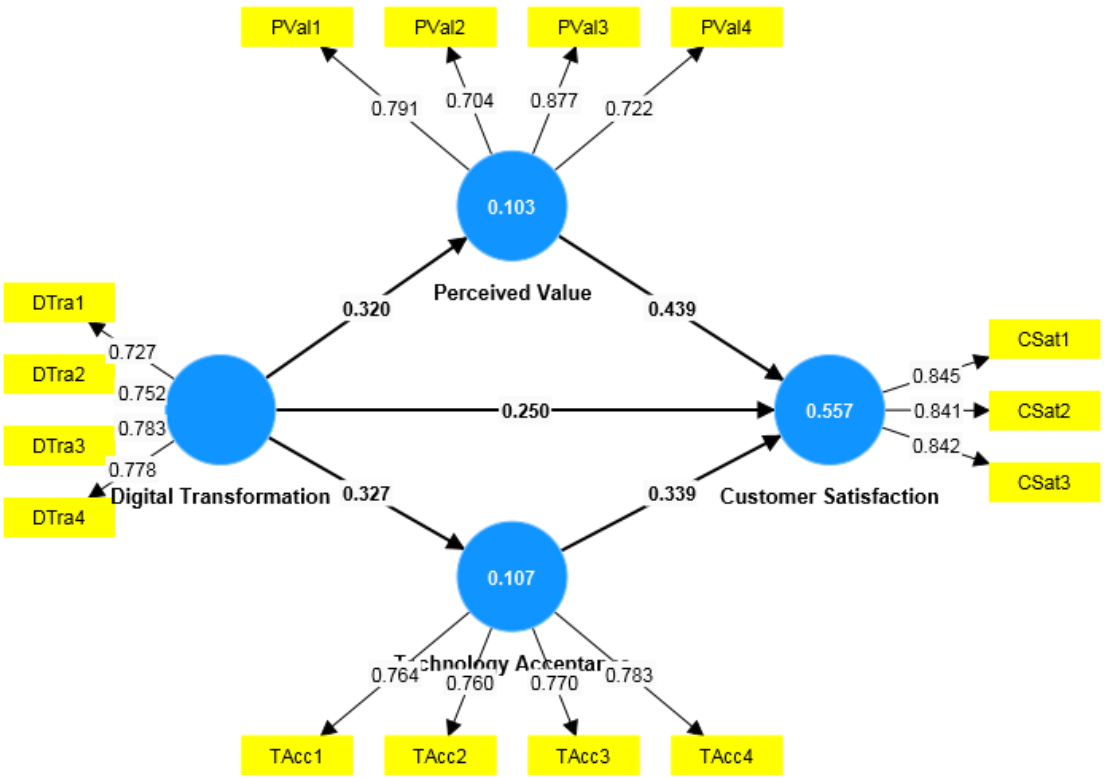

Figure 1.
Structural model analysis results.

5. Conclusion

The results of this study show the significant positive impact of digital transformation on customer satisfaction in the retail industry in Hanoi, Vietnam. Retailers must embrace digital technologies to enhance customer experience, create added value, and foster stronger engagement. Importantly, the study reveals that perceived value and technology acceptance are crucial mediators in this relationship. Retailers should prioritize enhancing customer perceptions of value and facilitating the acceptance of digital technologies. This can be achieved by focusing on personalization, tailored offerings, user-friendly interfaces, and value-added services. These findings offer practical implications for retail managers. Adopting a customer-centric approach to digital transformation is key. Leveraging digital technologies to enhance perceived value and facilitate technology acceptance should be prioritized. Regularly monitoring and measuring customer satisfaction in the context of digital transformation initiatives is crucial for making necessary adjustments.

While this study provides valuable insights, it is not without limitations. The research was conducted within a specific geographic context and retail sector, potentially limiting generalizability. Future research could explore the model's applicability in different settings. Additionally, the cross-sectional design could be expanded through longitudinal studies to examine long-term effects. Finally, exploring additional mediating or moderating variables could further enrich our understanding of this complex relationship.

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