

## SUSTAINING TRADITIONAL MARKETS IN THE DIGITAL ERA: THE ROLE OF TECHNOLOGY IN MODERATING MARKETPLACE AND CONSUMER BEHAVIOR IMPACTS IN RURAL INDONESIA

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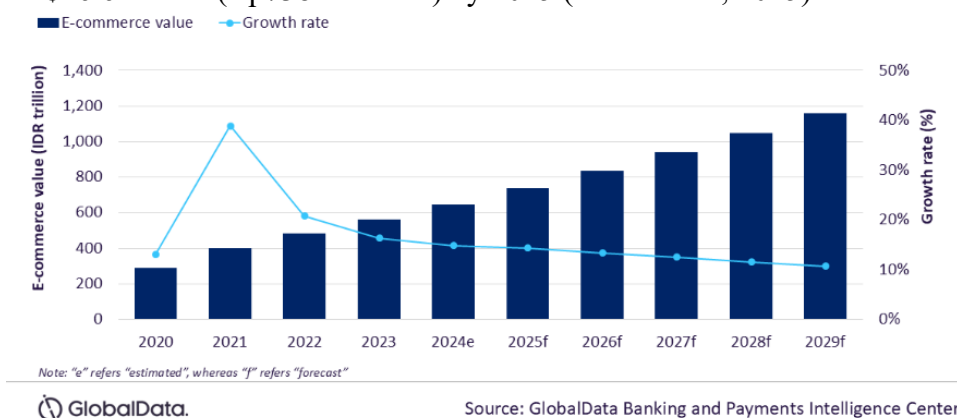
### Abstract

The rapid growth of the marketplace driven by digital technology has increased consumer appeal, but is inversely proportional to the decline in the turnover of non-food traditional market traders, especially in the Panimbang Market. This study aims to analyze the influence of marketplace and consumer behavior on the sustainability of traditional markets by considering the role of technological sophistication as a moderation variable in Panimbang Market, Banten. The main problem in this study lies in the existence of research gaps. This study uses a descriptive quantitative approach by collecting data through questionnaires that are distributed directly in physical form. The sampling technique used was non-probability sampling with the quota sampling method, where the research population included all traders of the Panimbang Market, and the sample number was set as 135 respondents. Data analysis was carried out using SmartPLS4 software version 4.1.1.4. The results of the study show that the marketplace and consumer behavior have a positive and significant effect on the sustainability of traditional markets. However, technological sophistication does not significantly moderate the influence of the marketplace, while consumer behavior has a significant negative effect, which indicates that the limitations of merchant digital literacy weaken the positive impact of consumer behavior on the sustainability of traditional markets.

Keywords: Technological Sophistication, Marketplace, Consumer Behavior, Traditional Market Sustainability.

### 1. Introduction

The rapid advancement of digital technology has accelerated the transformation of trade from traditional markets to online marketplaces. In Indonesia, this marketplace sector has experienced remarkable growth, with the e-commerce market projected to reach US\$46.6 billion (Rp738.2 trillion) by 2025 (GlobalData, 2025).



**Figure 1.** Indonesia: E-commerce Value 2025

However, this growth presents a stark contradiction with the declining fortunes of traditional markets. Empirical evidence reveals a troubling trend: traders in traditional markets, such as those in Pandeglang, report that consumers now primarily purchase only food items, leaving non-food stalls increasingly vacant (Irawan, 2024). This phenomenon is widespread, with a study by Arkan et al. (2024) finding that 88% of traders at Pondok Labu Market experienced a significant drop in revenue within a single year, underscoring a serious threat to the sustainability of traditional retail ecosystems.

A traditional market is defined as an economic center and a meeting place for sellers and buyers to conduct direct transactions of goods and services, a form that emerged from fundamental human needs (Putri et al., 2024; Gumelar et al., 2025). In contrast, the marketplace represents a modern digital platform that connects sellers and buyers online, facilitating transactions without geographical constraints and offering convenience, competitive prices, and various promotions (Pramarini, Sumaryanto & Lamidi, 2024; Savitri et al., 2023). The emergence of marketplaces has elicited mixed responses from traditional traders. While some view it as a threat leading to declining market conditions (Putri et al., 2024), others see it as an opportunity, with MSMEs adopting marketplaces reporting positive impacts (Maghfiroh, 2024). A significant challenge is the low level of digital adoption; data from the Central Statistics Agency (BPS) indicates that only about 12% of Indonesia's 64 million MSMEs effectively utilize digital technology (Fahrial, 2024).

A primary driver of this shift is changing consumer behavior. The technological sophistication of marketplaces allows consumers to compare prices, read reviews, and transact with unparalleled ease from their homes, making factors like convenience and promotions key shopping priorities (Harton, 2025; Syam et al., 2022). This transition is forcing traditional markets to innovate. Technological adaptation, through digital payments, online promotion, and internet-based ordering systems, is increasingly seen as a critical strategy for traditional markets to remain relevant and competitive (Maghfiroh, 2024; Fadhillah & Zulfa, 2022). Technology acts as a moderating factor that can determine the survival of traditional markets in the digital era (Permana et al., 2019).

The urgency of this research is high, as digital transformation is an inevitable force. Without immediate adaptation, traditional markets risk further marginalization. This study is motivated by a clear research gap. Previous findings on the impact of marketplaces are inconsistent; some studies report a negative effect on traditional market sustainability (Siahaan & When, 2024; Hartono, 2025), while others find a dual, both positive and negative, impact (Aprilia, Alawiyah & Lestari, 2024). Furthermore, few studies have explicitly positioned technology as a moderating variable that can clarify these conflicting results.

Therefore, this research aims to explore the impact of marketplaces and consumer behavior on the sustainability of traditional markets in the Panimbang area, Pandeglang, Banten, with technological sophistication as a moderating variable. The study seeks to provide insights for traditional traders in designing technology-based adaptive strategies and to offer strategic recommendations for the government in encouraging the digital transformation of traditional markets, thereby contributing to their long-term sustainability (Maria, Aziz, and Rahmawati, 2024; Albirruni, 2024). The article is organized as follows: after this introduction, a theoretical background and hypothesis development are presented, followed by the research methods, results and discussion, and finally, the conclusion, implications, and limitations.

## 2. Theoretical Background

### 2.1 Theoretical Foundation

#### 2.1.1 Utility Theory

Introduced by Peter C. Fishburn (1968), Utility Theory posits that consumers make choices to maximize satisfaction (utility) from unlimited needs despite facing limited resources. A key concept is the Law of Diminishing Marginal Utility, which states that the additional satisfaction (marginal utility) gained from consuming each additional unit of a good or service decreases. This theory helps explain how consumers rationally allocate their resources, often shifting to alternatives that offer higher marginal utility, and is fundamental to understanding consumer decision-making between traditional markets and digital platforms (Girikallo et al., 2023).

#### 2.1.2 Stimulus-Organism-Response (S-O-R) Theory

The S-O-R theory, developed by Mehrabian and Russell (1974), provides a framework for understanding how external stimuli influence internal cognitive and affective states, which in turn drive behavioral responses. In this context, marketplace features like lower prices, promotions, and convenience act as Stimuli (S). These are processed internally by the consumer (Organism - O), affecting their perceptions and emotions, and ultimately leading to a Response (R), such as a shift in shopping preference from traditional markets to online platforms (Hochreiter et al., 2023).

### 2.2 Literature Review and Hypothesis Development

#### 2.2.1 Marketplace

A marketplace is a digital platform that facilitates online transactions between sellers and buyers (Laudon & Traver, 2020). It offers advantages such as a wider product variety, greater market reach, and transactional convenience (Ramadhani et al., 2025). However, it also creates intense competition and can negatively impact traditional market traders who struggle to compete on price and convenience (Hanif et al., 2024). Based on this, the first hypothesis is proposed: *H1: Marketplaces have a significant negative effect on the sustainability of traditional markets.*

#### 2.2.2 Consumer Behavior

Consumer behavior encompasses the process individuals use to select, use, and evaluate products and services, influenced by cultural, social, personal, and psychological factors (Dharmawan & Oktafani, 2022). The shift towards online shopping, driven by the ease of price comparison and home delivery, signifies a major change in consumer behavior that threatens the footfall and revenue of traditional markets. Therefore, the second hypothesis is: *H2: Changes in consumer behavior (towards online shopping) have a significant negative effect on the sustainability of traditional markets.*

#### 2.2.3 Technological Sophistication

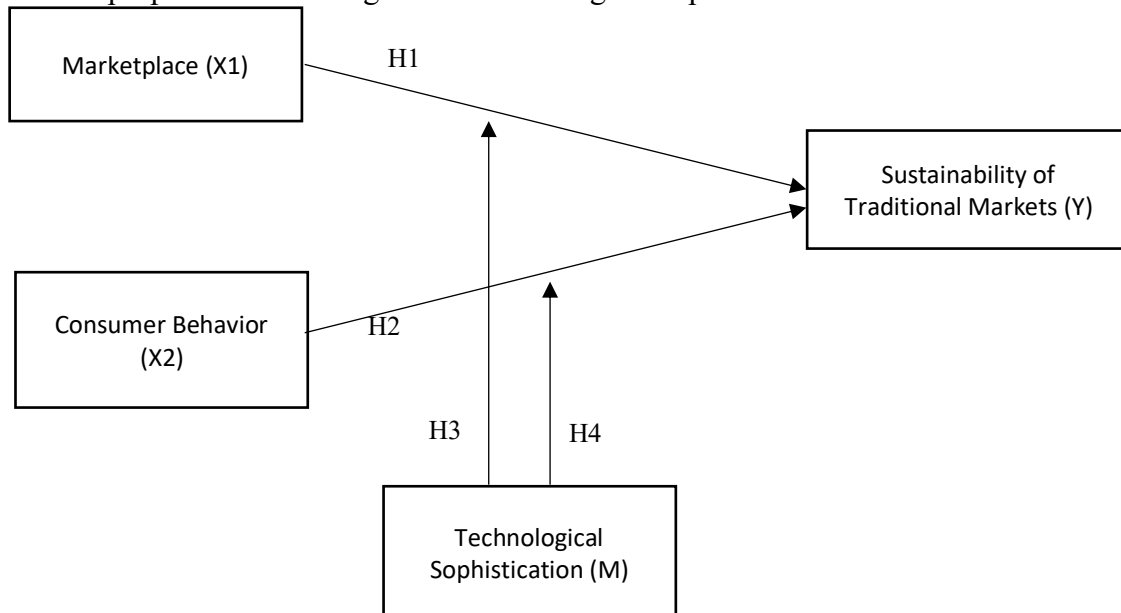
Technological sophistication refers to the adoption and use of digital tools, such as digital payments, social media marketing, and e-commerce integration. For traditional markets, technology is not just a tool but a critical driver of transformation that can improve operational efficiency and marketing reach (Nurhasnah, 2022; Annisa et al., 2024). It is posited that technology can act as a strategic buffer, helping traditional markets adapt to external pressures. This leads to the moderating hypotheses: *H3: Technological sophistication moderates the influence of marketplaces on traditional*

*market sustainability, such that the negative effect is weaker when technological sophistication is high.*

*H4: Technological sophistication moderates the influence of consumer behavior on traditional market sustainability, such that the negative effect is weaker when technological sophistication is high.*

### 2.3 Conceptual Framework

The conceptual framework below illustrates the relationships between the variables and the proposed moderating role of technological sophistication.



**Figure 2.** Conceptual Framework

## 3. Methods

### 3.1 Research Design

This study employs a quantitative approach with an associative design to examine the relationships between variables, including the moderating effect. The analysis was conducted using the Partial Least Squares – Structural Equation Modeling (PLS-SEM) method with SmartPLS 4 software, which is suitable for predictive research models and theory development (Hair et al., 2019).

### 3.2 Population and Sample

The research object comprises traditional market traders in Panimbang District, Pandeglang Regency, Banten. Using a non-probability sampling technique with quota sampling, the study selected 135 traders divided equally into three categories: basic and fresh goods traders, clothing and textile traders, and other traders. This sample size meets the recommended criteria for PLS-SEM analysis (Hair et al., 2019).

### 3.3 Data Collection Techniques

Primary data were collected through a structured questionnaire using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The questionnaire measured traders' perceptions of marketplace influence, consumer behavior, traditional market sustainability, and technological sophistication. Supplementary field observations were conducted to understand market conditions and trader-consumer interactions.

### 3.4 Operational Definitions and Variable Measurement

The variables were operationally defined and measured as follows:

**Table 1.** Variable Operationalization

Variable	Operational Definition	Indicators	Measurement	Source
Marketplace	Digital platform for selling and marketing products using internet media	<ul style="list-style-type: none"> <li>• Easy access</li> <li>• Competitive pricing</li> <li>• Secure transactions</li> <li>• Seamless communication</li> </ul>	Ordinal Scale (1-5)	Azizah et al. (2025) Ma'rifah et al. (2022)
Consumer Behavior	Decision-making process to use goods/services for need satisfaction	<ul style="list-style-type: none"> <li>• Attitudes and cognition</li> <li>• Price sensitivity</li> <li>• Social influence</li> <li>• Product availability</li> </ul>	Ordinal Scale (1-5)	Ndruru et al. (2025) Isnaini & Nurhadi (2023)
Traditional Market Sustainability	Ability to maintain operations and relevance amid e-commerce challenges	<ul style="list-style-type: none"> <li>• Competitiveness</li> <li>• Business profitability</li> <li>• Economic viability</li> <li>• Customer retention</li> </ul>	Ordinal Scale (1-5)	Siahaan & When (2024) Hidayat et al. (2024)
Technological Sophistication	Technology's ability to transform business operations and customer interactions	<ul style="list-style-type: none"> <li>• Digital payment adaptation</li> <li>• Social media utilization</li> <li>• Digital literacy</li> <li>• Innovation capability</li> </ul>	Ordinal Scale (1-5)	Fauziah et al. (2024) Prasojo & Hidayah (2023)

### 3.5 Data Analysis Technique

Data analysis followed a two-stage PLS-SEM approach:

- 1) Outer Model Assessment: Testing convergent validity (factor loading > 0.7, AVE > 0.5), discriminant validity (HTMT ratio < 0.9), and reliability (Composite Reliability > 0.7, Cronbach's Alpha > 0.7)
- 2) Inner Model Assessment: Evaluating structural relationships through path coefficients, R-squared values, and hypothesis testing using bootstrapping with 5000 subsamples
- 3) Moderation Analysis: Testing the moderating effect of technological sophistication using the interaction term approach in PLS-SEM

The analysis followed the systematic procedure recommended by Hair et al. (2019) for variance-based SEM, ensuring robust validation of the research model and hypotheses.

## 4. Results and Discussion

### 4.1 Descriptive Statistics

This study involved 135 traders from Panimbang Traditional Market, Banten, selected through quota sampling across three categories: basic necessities (45), clothing/textiles (45), and other goods (45). Table 1 presents the respondent characteristics.

**Table 2.** Respondent Characteristics

Category	Classification	Frequency	Percentage
Age	<20 years	10	7%
	21-30 years	25	19%
	31-40 years	61	45%
	>40 years	39	29%
Gender	Male	51	38%
	Female	84	62%
Marketplace Usage	Yes	11	9%
	No	123	91%

Source: Primary data, processed 2025

The data reveals limited digital adoption among traders, with only 9% utilizing marketplaces. Table 3 shows the descriptive statistics of research variables.

**Table 3.** Descriptive Statistics of Research Variables

Variable	Mean	Min Scale	Max Scale	Std. Deviation
Marketplace (X1)	2.601	1.000	5.000	0.918
Consumer Behavior (X2)	2.949	1.000	4.875	0.817
Traditional Market Sustainability (Y)	3.245	1.250	5.000	0.778
Technological Sophistication (M)	2.349	1.000	5.000	0.946

Source: SmartPLS4 processed data, 2025

Traditional Market Sustainability shows the highest mean (3.245), while Technological Sophistication shows the lowest (2.349), indicating adequate current sustainability but limited digital capabilities among traders.

### 4.2 Measurement Model (Outer Model) Evaluation

The measurement model assessment confirmed validity and reliability. All constructs demonstrated adequate convergent validity with factor loadings >0.5 and AVE >0.5. Table 4 presents the reliability and validity results.

**Table 4.** Construct Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability	AVE
Technological Sophistication	0.962	0.967	0.748
Marketplace	0.863	0.893	0.512
Consumer Behavior	0.864	0.893	0.513
Traditional Market Sustainability	0.876	0.903	0.544

Source: SmartPLS4 processed data, 2025

All constructs exceeded the threshold values (Cronbach's Alpha >0.7, CR >0.7, AVE >0.5), confirming the measurement model's adequacy for structural analysis.



#### 4.3 Structural Model (Inner Model) Evaluation

##### 4.3.1 Coefficient of Determination ( $R^2$ )

**Table 5.** R-Squared Test Results

Variable	R-square	R-square adjusted
Traditional Market Sustainability	0.533	0.515

Source: SmartPLS4 processed data, 2025

The  $R^2$  value of 0.533 indicates that 53.3% of Traditional Market Sustainability variance is explained by the independent and moderating variables, classified as moderate explanatory power.

##### 4.3.2 Hypothesis Testing

**Table 5.** Hypothesis Testing Results

Hypothesis	Original Sample	T-statistics	P-values	Result
H1: Marketplace $\rightarrow$ Sustainability	0.306	3.469	0.001	Supported
H2: Consumer Behavior $\rightarrow$ Sustainability	0.384	5.043	0.000	Supported
H3: Tech Sophistication $\times$ Marketplace $\rightarrow$ Sustainability	0.109	1.340	0.180	Not Supported
H4: Tech Sophistication $\times$ Consumer Behavior $\rightarrow$ Sustainability	-0.200	2.828	0.005	Supported

Source: SmartPLS4 processed data, 2025

#### 4.4 Discussion

##### 4.4.1 The Impact of Marketplace on Traditional Market Sustainability

Hypothesis 1 (H1) is supported ( $\beta=0.306$ ,  $p=0.001$ ), indicating that marketplace presence positively influences traditional market sustainability. This finding aligns with Azizah et al. (2025) and can be explained through Stimulus-Organism-Response theory. While marketplaces offer competitive stimuli, traditional markets maintain advantages through direct social interaction, product quality trust, and price bargaining flexibility (Rustini et al., 2025). From a utility theory perspective, traditional markets provide unique utilities that digital platforms cannot replicate, particularly in social engagement and fresh product authenticity (Girikallo et al., 2023).

##### 4.4.2 The Impact of Consumer Behavior on Traditional Market Sustainability

Hypothesis 2 (H2) is supported ( $\beta=0.384$ ,  $p=0.000$ ), demonstrating that consumer behavior significantly affects sustainability. Environmental awareness, local product support, and emotional attachment contribute to continued market patronage. Consumers value fresh product availability, direct quality inspection, and community economic support (Wigiyanti & Kakiay, 2022). This aligns with Hartono (2025), suggesting that traditional markets can maintain relevance by meeting evolving consumer expectations through modernized strategies.

##### 4.4.3 The Moderating Role of Technological Sophistication

Hypothesis 3 (H3) is not supported ( $\beta=0.109$ ,  $p=0.180$ ), indicating technological sophistication doesn't significantly moderate the marketplace-sustainability relationship. The low digital adoption rate (91% non-users) explains this finding. Traders' limited

digital literacy prevents effective utilization of e-commerce platforms, despite recognizing digital trends (Siahaan et al., 2024).

Hypothesis 4 (H4) is supported but with negative moderation ( $\beta=-0.200$ ,  $p=0.005$ ). Technological sophistication weakens the consumer behavior-sustainability relationship, suggesting traders' digital capabilities cannot match rapid consumer behavior shifts toward digital platforms. From a utility theory perspective, when traders fail to offer comparable digital utilities, consumers increasingly migrate to marketplaces (Girikallo et al., 2023). This highlights the urgent need for digital education and e-commerce integration programs (Nisaputra, 2022).

#### 4.5 Theoretical and Practical Implications

The findings demonstrate the complex interplay between digital transformation and traditional market sustainability. While traditional markets maintain inherent advantages, their long-term viability depends on strategic digital adaptation. The negative moderating effect of technological sophistication underscores the critical importance of building digital capacity among traders. Practical interventions should focus on digital literacy training, e-commerce platform integration, and developing hybrid business models that leverage both physical and digital commerce strengths.

### 5. Conclusion

#### 5.1 Summary of Findings

This study yields four key findings regarding the sustainability of Panimbang Traditional Market in the digital era:

First, marketplaces demonstrate a positive and significant effect on traditional market sustainability ( $\beta=0.306$ ,  $p=0.001$ ). Contrary to initial assumptions, the presence of digital platforms serves as a complementary marketing channel rather than a direct threat. Traditional markets maintain unique competitive advantages through direct social interaction, quality verification capabilities, and price bargaining flexibility that cannot be fully replicated by digital platforms.

Second, consumer behavior significantly contributes to market sustainability ( $\beta=0.384$ ,  $p=0.000$ ). Consumer preferences for fresh products, environmental awareness, emotional attachment, and trust in market traders remain crucial factors. Non-economic elements, particularly social interaction and personalized shopping experiences, continue to play a vital role in maintaining consumer loyalty to traditional markets.

Third, technological sophistication does not significantly moderate the relationship between marketplaces and traditional market sustainability ( $\beta=0.109$ ,  $p=0.180$ ). This indicates that the current level of digital literacy among traders is insufficient to leverage marketplace platforms effectively as strategic tools for business expansion and sustainability enhancement.

Fourth, technological sophistication negatively moderates the relationship between consumer behavior and market sustainability ( $\beta=-0.200$ ,  $p=0.005$ ). This counterintuitive finding suggests that the rapid shift in consumer behavior toward digital commerce is not adequately matched by traders' technological adaptation capabilities, resulting in technology acting as a disruptive rather than supportive factor.

#### 5.2 Theoretical and Practical Implications

The research confirms that traditional market sustainability in Panimbang can be maintained through strategic marketplace utilization and consumer behavior



management. However, the digital literacy gap among traders represents the primary constraint. The findings highlight the complex interplay between digital transformation and traditional commerce, where technology can simultaneously present opportunities and challenges depending on adoption capacity.

From a practical perspective, comprehensive digital technology education, literacy enhancement programs, and e-commerce platform integration are essential to enable traditional market traders to adapt to evolving consumer behavior while maximizing marketplace potential. Through these interventions, traditional markets can not only survive but also thrive and compete effectively amid rapid digital commerce transformation.

### 5.3 Limitations and Research Recommendations

This study was limited to Panimbang Traditional Market in Pandeglang Regency, which may affect the generalizability of findings. Future research should expand to traditional markets in other regions and incorporate additional variables such as government support policies, cultural factors, and local marketing strategies. Qualitative approaches through in-depth interviews could provide deeper insights into traders' adaptation strategies. Furthermore, researchers should explore the optimal balance between maintaining traditional market characteristics and implementing digital transformation to achieve sustainable competitiveness.

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