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Analyzing the Impact of AI-Based Personalization and E-Service Quality on Customer Retention in E-Commerce: The Mediating Role of Customer Satisfaction

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ABSTRACT

The rapid digital transformation has driven e-commerce enterprises to adopt Artificial Intelligence (AI) technologies to sustain customer loyalty in a hyper-competitive market environment. This study aims to analyze the impact of AI-based personalization and e-service quality on customer retention, with customer satisfaction serving as a mediating variable. Employing a quantitative approach, the study utilizes Structural Equation Modeling-Partial Least Squares (SEM-PLS). Data were gathered through an online survey administered to 200 active e-commerce users in Indonesia. The findings demonstrate that both AI-based personalization and e-service quality exert a positive and significant effect on customer satisfaction, which subsequently leads to higher customer retention. Furthermore, customer satisfaction is empirically proven to partially mediate these relationships. These insights offer actionable managerial implications for platform managers to optimize recommendation algorithms alongside operational service reliability.

Keyword : Artificial Intelligence, E-Commerce, E-Service Quality, Customer Retention, Customer Satisfaction.

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1. INTRODUCTION

The rapid acceleration of the global and regional digital economy has fundamentally transformed the competitive business landscape, positioning the e-commerce ecosystem as a primary pillar of modern retail growth [1]. This phenomenon has triggered a shift in consumer behavior toward an increasing reliance on digital platforms for daily needs, driven by enhanced accessibility, extensive product selection, and time efficiency. However, the highly competitive nature of the digital market introduces new strategic hurdles, notably low customer switching costs. Consequently, relying solely on customer acquisition strategies is no longer sufficient, compelling firms to shift their strategic focus toward customer retention to secure long-term business sustainability [2].

From a financial perspective, extensive literature in digital business management emphasizes that retaining existing customers is significantly more cost-effective than acquiring new ones [3]. Within platform-based business models, consumer loyalty and retention are strongly driven by perceived satisfaction regarding the value delivered by technology. Modern digital consumers do not merely seek competitive pricing; they demand an intuitive, secure, and highly relevant customer journey tailored to their individual preferences. Therefore, e-commerce managers face an urgent imperative to leverage advanced technological instruments capable of continuously meeting evolving consumer expectations.

One of the most pivotal technological breakthroughs in the contemporary digital business landscape is the implementation of artificial intelligence, particularly *AI-based personalization* [4]. Through machine learning algorithms and big data analytics, e-commerce platforms can deliver hyper-personalized product recommendations, adapt user interfaces based on browsing history,

and proactively predict consumer demand [5]. This personalized interaction effectively reduces consumers' cognitive load when filtering information, ultimately generating a more satisfying shopping experience. Nevertheless, applying AI in marketing personalization also sparks ongoing debate regarding its boundaries, particularly when predictive algorithms are perceived as overly intrusive regarding user privacy.

Beyond the sophistication of AI personalization, the operational foundation of digital business remains heavily reliant on *e-service quality* [6]. *E-service quality* encompasses a comprehensive evaluation of platform performance, ranging from site or app navigation efficiency and system availability to order fulfillment accuracy and data privacy protection [7], [8]. Regardless of how advanced an AI recommendation engine may be, user satisfaction will inevitably collapse if it is not supported by reliable operational infrastructure, such as system crashes during checkout, delayed deliveries, or personal data breaches.

Although *AI-based personalization* and *e-service quality* have been extensively examined in separate literature streams, integrating both variables into a comprehensive framework to predict customer retention specifically with *customer satisfaction* as a mediator requires deeper empirical verification in emerging markets [9], [10]. Most prior studies have focused primarily on the impact of AI on initial purchase intention, whereas its influence on post-purchase continuance behavior remains relatively under-researched. To address this research gap, this study aims to empirically examine how AI-based personalization and e-service quality influence customer retention, both directly and indirectly through customer satisfaction.

2. RESEARCH METODE

This research is anchored in two theoretical frameworks: Expectation-Confirmation Theory (ECT) [9] and the Technology Acceptance Model (TAM) [1]. ECT posits that customer satisfaction is determined by the evaluation between initial expectations and perceived performance after actual usage, driving post-purchase continuance behaviors [9]. TAM suggests that system adoption relies on perceived usefulness and ease of use, where AI personalization enhances usefulness and E-Service Quality ensures operational ease [1].

AI-based personalization refers to an e-commerce platform's algorithmic capacity to analyze big data and deliver hyper-tailored product recommendations [4]. By filtering out irrelevant options, AI personalization minimizes cognitive search effort, elevating customer satisfaction [5], [10]. Furthermore, E-Service Quality (ESQ) measures the extent to which a platform facilitates efficient shopping, purchasing, and delivery [6]. High platform availability, transaction security, and order accuracy build user confidence [7], [8]. Consequently, customer satisfaction—a post-consumption evaluationserves as a vital mediator that converts positive platform evaluations into long-term customer retention [2], [3].

The conceptual framework and hypotheses of this research are formulated as follows:

- H1: *AI-based personalization has a positive and significant effect on customer satisfaction.*
- H2: *E-service quality has a positive and significant effect on customer satisfaction.*
- H3: *Customer satisfaction has a positive and significant effect on customer retention.*
- H4a: *Customer satisfaction mediates the relationship between AI-based personalization and customer retention.*
- H4b: *Customer satisfaction mediates the relationship between e-service quality and customer retention.*

This study employs a quantitative, cross-sectional research design [1]-[3]. The target population consists of active e-commerce platform consumers in Indonesia. Non-probability purposive sampling was applied with inclusion criteria: respondents must be at least 18 years old and have executed at least two purchases within the past 3 months. A total of 200 valid responses were gathered. All constructs were measured using a 5-point Likert scale adapted from established literature [1]-[4]. Data analysis was executed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS software [11].Table 1 presents the performance indicators and operational metrics used in the evaluation model.

Variable	Code	Indicators
AI-Based Personalization	AIP	Recommendation accuracy, promotional relevance, search ease, responsiveness [4], [5]
E-Service Quality	ESQ	Navigation efficiency, platform uptime, fulfillment accuracy, privacy protection [6], [7]
Customer Satisfaction	CS	Expectation confirmation, positive experience, choice confidence [9]
Customer Retention	CR	Repurchase intention, platform preference, positive advocacy [2], [3]

The structural relationship of the research framework and analytical procedure is illustrated in Figure 1.

3. RESULT AND DISCUSSION

In this section, the results of the research are explained alongside a comprehensive discussion. The data evaluation followed a two-stage PLS-SEM procedure consisting of measurement model assessment and structural model testing.

A. Measurement Model Assessment (Outer Model)

The outer model evaluation confirmed robust measurement properties. All item factor loadings exceeded the standard 0.70 threshold, and Average Variance Extracted (AVE) values for all constructs surpassed 0.50 [11]. Cronbach's Alpha and Composite Reliability scores for every construct exceeded 0.80, indicating high internal consistency reliability [11].

B. Structural Model Assessment (Inner Model) and Hypothesis Testing

The structural model yielded an R^2 of 0.624 for Customer Satisfaction, indicating that 62.4% of its variance is explained by AI-based personalization and e-service quality. Meanwhile, the R^2 for Customer Retention was 0.582 (58.2%).

The mathematical formulation for the direct relation estimation is expressed in (1):

$$CS = \beta^1 (AIP) + \beta^2 (ESQ) \in$$

Hypothesis testing was conducted using nonparametric bootstrapping with 5,000 re-samples. Table 2 summarizes the hypothesis testing results.

Table 2. Hypothesis Testing Results

Hypothesis	**Path**	**Path Coefficient (β)**	**t-Statistic**	**p-Value**	**Decision**
H1	AIP > CS	0.385	4.821	0.000	Supported
H2	ESQ > CS	0.442	5.312	0.000	Supported
H3	CS > CR	0.612	8.104	0.000	Supported
H4a	AIP > CS > CR	0.235	3.912	0.000	Supported (Mediation)

H4b	ESQ > CS > CR	0.270	4.215	0.000	Supported (Mediation)

The empirical findings confirm that AI-based personalization significantly drives customer satisfaction ($\beta = 0.385$, $p < 0.05$). Smart product predictions minimize cognitive search effort, boosting user gratification [4]. Concurrently, e-service quality emerges as the strongest direct predictor of customer satisfaction ($\beta = 0.442$, $p < 0.05$), reinforcing that core operational execution, transaction security, and system stability remain indispensable [6]. Finally, customer satisfaction partially mediates the structural relationships, validating the tenets of Expectation-Confirmation Theory [9].

4. CONCLUSION

This study successfully evaluates the integrated impact of Artificial Intelligence (AI)-based personalization and Electronic Service Quality (E-Service Quality) on customer retention within the rapidly evolving e-commerce landscape of an emerging market context. By synthesizing Expectation-Confirmation Theory (ECT) and the Technology Acceptance Model (TAM), the empirical findings demonstrate that both advanced algorithmic personalization and foundational digital service execution serve as critical antecedents to customer satisfaction. The structural model confirms that customer satisfaction plays a fundamental role in driving long-term customer retention, thereby validating the post-purchase continuation mechanism in digital platform ecosystems.

From an algorithmic and technical perspective, the results highlight that AI-based personalization significantly enhances customer gratification by mitigating cognitive search overload and delivering high-precision product recommendations. However, technological sophistication alone is insufficient. The findings emphasize that E-Service Quality remains the primary determinant of user satisfaction, demonstrating that core system infrastructure specifically high application availability, frictionless checkout efficiency, robust data privacy safeguards, and order fulfillment accuracy acts as an essential prerequisite for sustaining consumer trust.

Practically, this research yields strategic managerial implications for e-commerce developers, digital strategists, and platform operators. Executives must prioritize balanced investments between AI model refinement and core IT infrastructure. While machine learning models should be continuously optimized to deliver hyper-personalized experiences, engineering teams must maintain zero-downtime server architectures, transparent data encryption standards, and dependable operational logistics. Mitigating privacy risks while optimizing recommendation relevance will be pivotal in preventing customer churn in highly competitive digital markets.

Despite its empirical contributions, this study acknowledges certain limitations that provide avenues for future scholarly work. The sample scope was cross-sectional and restricted to general e-commerce platforms in Indonesia. Future research is encouraged to conduct longitudinal investigations to observe retention dynamics over extended timeframes. Additionally, comparative studies across distinct digital business frameworks such as social commerce, live-stream shopping, and pure-play e-commerce platforms as well as the inclusion of potential moderating constructs such

as customer switching costs or digital literacy, would further enrich the theoretical generalization of this framework.

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