Indonesian Journal of Business and Entrepreneurship, Vol. 12 No. 2, May 2026
Permalink/DOI: http://dx.doi.org/10.17358/IJBE.12.2.283

Available online at
http://journal.ipb.ac.id/index.php/ijbe

BEYOND BIG DATA: THE DUAL MEDIATION OF PERCEIVED PERSONALIZATION AND CUSTOMER ENGAGEMENT IN THE ANALYTICS LOYALTY LINK WITHIN DIGITAL MARKETS

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Article history:

Received
29 December 2025

Revised
7 January 2026

Accepted
25 May 2026

Available online
30 May 2026

Abstract:

Background: Digital marketplaces leverage Big Data Analytics (BDA) to understand customer behavior, but the mechanisms by which BDA forms loyalty remain unclear, particularly through personalized perceptions and customer engagement; whereas competition and low switching costs make loyalty difficult to maintain.
Purpose: The purpose of this study is to examine the effect of BDA capabilities on customer loyalty and the dual mediating role of perceived personalization (PP) and customer engagement (CE) in the digital marketplace.
Design/methodology/approach: A cross-sectional quantitative study on 300 marketplace users in Surabaya (≥17 years; ≥3 transactions/6 months) with purposive sampling. Data were collected via a Likert scale online questionnaire (items adapted from the literature) and analyzed with PLS-SEM (SmartPLS 4.0) and bootstrapping for mediation tests
Findings/Result: The results show that the use of big data analytics in digital marketplaces is able to strengthen customer loyalty through two main channels. First, as the platform gets better at processing and utilizing customer data, customers increasingly feel that there are services that suit their personal needs, such as relevant product recommendations, targeted offers, and a shopping experience that feels "understood". Second, the use of big data analytics also encourages customers to be more involved, for example more actively interacting with platform features, providing responses, and building more intense relationships with the marketplace. Furthermore, both customers' perceived sense of personalization and increased engagement have been shown to contribute to loyalty, which can be seen in the tendency of customers to continue using the same marketplace, make repeat purchases, and recommend them to others. These findings also confirm that big data analytics not only directly affect loyalty, but primarily work by improving the personalized customer experience and encouraging active engagement, both through individual channels and as a series of interconnected processes.
Conclusion: Big data analytics capabilities are an important determinant in building loyalty in the digital marketplace, but the benefits are strongest when big data analytics is realized as an experience that feels personalized and triggers active customer engagement. Based on these findings, companies need to integrate analytics investments with relevant personalization designs and ongoing engagement strategies to build long-term loyalty.
Originality/value (State of the art): This study proposes an integrated dual/sequential mediation model that combines resource-based theory and customer engagement theory to explain the psychological behavioral pathways of loyalty formation in the Indonesian digital market.

Keywords: big data analytics, perceived personalization, customer engagement, customer loyalty, digital market

How to Cite:
Purwanto, N., Amelia, & Irawan, N. (2026). Beyond big data: The dual mediation of perceived personalization and customer engagement in the analytics loyalty link within digital markets. Indonesian Journal of Business and Entrepreneurship, 12(2), 283. http://dx.doi.org/10.17358/IJBE.12.2.283

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INTRODUCTION

The rapid expansion of digital marketplaces has fundamentally transformed the global economy, reshaping how firms interact with consumers and how value is created and sustained. Digital platforms now serve as the primary interface between firms and customers, enabling transactions, interactions, and data exchanges at unprecedented scale. In this environment, customer loyalty has become increasingly difficult to secure due to intensified competition, low switching costs, and the abundance of alternative platforms offering similar products and services. Consequently, digital marketplace firms are under growing pressure to leverage advanced technologies to retain customers and sustain competitive advantage.

Big Data Analytics (BDA) has emerged as a strategic capability that allows firms to collect, process, and analyze vast volumes of structured and unstructured customer data in real time. Through BDA, firms can better understand customer preferences, predict behavior, and optimize marketing decisions. Prior research suggests that firms with superior analytics capabilities outperform competitors in customer acquisition, retention, and profitability (Kamel, 2023). However, despite substantial investments in analytics infrastructure, many digital platforms fail to translate analytical insights into enduring customer loyalty. This paradox indicates that analytics alone may be insufficient unless it is effectively transformed into customer-perceived value.

Recent developments in digital marketing and platform-based commerce show that customer loyalty is increasingly shaped by the ability of firms to transform customer data into relevant, personalized, and engaging experiences (Theodorakopoulos & Theodoropoulou, 2024). In highly competitive digital marketplaces, customers can easily compare prices, switch platforms, and access similar products across multiple providers. As a result, loyalty is no longer determined only by transactional convenience or price competitiveness, but also by the extent to which platforms are able to understand customers, personalize interactions, and maintain continuous engagement across digital touchpoints.

Big Data Analytics (BDA) capability has therefore become a strategic organizational resource in digital marketplace competition. Prior studies have shown that BDA enables firms to collect, integrate, process, and interpret large volumes of customer data to improve decision-making, market responsiveness, and firm performance. (Dahiya et al. 2022) From a Resource-Based Theory perspective, BDA capability can be considered a valuable, rare, and difficult-to-imitate resource because it allows firms to generate superior customer insights and develop data-driven marketing strategies. However, much of the existing literature has focused on organizational level outcomes, such as operational efficiency, dynamic capability, innovation, market performance, and competitive advantage. This stream of research confirms the strategic importance of BDA, but provides limited explanation of how analytics capability is translated into customer level loyalty outcomes.

In parallel, the personalization literature has emphasized that data-driven and AI-supported personalization can improve customer experience by delivering more relevant recommendations, offers, content, and service interactions (Vashishth et al. 2024). Personalized touchpoints are increasingly viewed as critical elements of digital customer experience because they reduce search effort, increase perceived relevance, and create a sense that the platform understands individual customer preferences. Nevertheless, personalization does not automatically produce loyalty. Customers may respond positively when personalization is perceived as useful, relevant, and trustworthy, but they may also react negatively when personalization is perceived as intrusive, excessive, or privacy-threatening. Therefore, perceived personalization is a crucial psychological mechanism that explains how analytics-driven actions are interpreted by customers before they influence loyalty (Jayapal, 2025).

Customer engagement has also become a central construct in contemporary marketing research. Recent studies conceptualize customer engagement as a multidimensional construct involving cognitive, emotional, and behavioral investment in interactions with a brand or platform (Roy et al. 2022). In digital marketplaces, engagement may appear through repeated platform visits, interaction with platform features, responses to recommendations, participation in reviews, and continued communication with the platform. Customer engagement is important because it represents an active relational process rather than a passive evaluation of service quality. However, while engagement has been widely recognized as

an antecedent of loyalty, the role of BDA capability in stimulating engagement through perceived personalization remains insufficiently examined.

The current literature reveals three important gaps. First, previous studies have mostly examined BDA capability from a firm-centered perspective, while customer level mechanisms remain underdeveloped. Second, perceived personalization and customer engagement are often studied separately, although both constructs are theoretically connected in digital marketplace interactions. Analytics driven personalization may first shape customers' perception that the platform provides relevant and individualized experiences, which subsequently encourages stronger engagement with the platform. Third, limited empirical evidence exists on dual and sequential mediation models that explain how BDA capability influences customer loyalty through both psychological and behavioral pathways, particularly in emerging digital markets such as Indonesia.

Addressing these gaps, this study offers theoretical novelty by integrating Resource Based Theory and Customer Engagement Theory into a single customer-centric model. The study conceptualizes BDA capability as a strategic organizational resource whose value is realized through perceived personalization and customer engagement. Perceived personalization is positioned as a psychological mechanism that reflects customers' interpretation of analytics-driven services, while customer engagement is positioned as a behavioral relational mechanism that converts personalized experiences into loyalty. Thus, this study advances the literature by proposing and testing a dual and sequential mediation model linking BDA capability, perceived personalization, customer engagement, and customer loyalty in the context of Indonesian digital marketplaces.

To address these limitations, this study adopts an integrated theoretical approach by combining Resource-Based Theory (RBT) and Customer Engagement Theory. From an RBT perspective, big data analytics capabilities are viewed as valuable, rare, and difficult-to-imitate organizational resources that enable firms to generate superior customer experiences. However, the value of these resources is only realized when customers perceive tangible benefits from analytics-driven actions.

Customer Engagement Theory complements this view by explaining how customer perceptions translate into active participation, emotional connection, and behavioral commitment. Building on these theoretical foundations, this study proposes a dual and sequential mediation model in which big data analytics capabilities enhance perceived personalization, which in turn stimulates customer engagement, ultimately leading to stronger customer loyalty. This approach allows for a more nuanced understanding of how analytics investments are converted into psychological and behavioral outcomes in digital markets.

Methodologically, the study employs a quantitative, cross-sectional design and uses Partial Least Squares Structural Equation Modeling (PLS-SEM) to test complex mediation relationships. This approach is particularly suitable for theory development and prediction-oriented research involving multiple latent constructs and indirect effects.

Based on the identified gaps and theoretical considerations, the purposes of this study are fourfold. First, it aims to examine the direct effect of big data analytics capabilities on customer loyalty in digital marketplaces. Second, it seeks to investigate the mediating role of perceived personalization in the relationship between analytics capabilities and customer loyalty. Third, it analyzes the mediating role of customer engagement in linking analytics capabilities to loyalty outcomes. Finally, and most importantly, this study tests a dual and sequential mediation model in which perceived personalization and customer engagement jointly explain how big data analytics capabilities translate into customer loyalty.

By addressing these objectives, this research contributes to the literature by advancing a more integrated and customer-centric understanding of data-driven loyalty formation. It also provides actionable insights for digital marketplace managers on how to align analytics investments with personalization strategies and engagement initiatives to build sustainable customer loyalty in highly competitive digital environments.

METHODS

This study employed a quantitative research approach with a cross-sectional survey design to examine the relationships among Big Data Analytics (BDA)

capabilities, perceived personalization (PP), customer engagement (CE), and customer loyalty (CL) in digital marketplace environments. A quantitative design is appropriate because the study aims to test theoretically grounded hypotheses and mediation mechanisms among latent constructs using statistical modeling (Hair et al. 2021) The study relied on primary data collected directly from individual users of digital marketplace platforms. Primary data were chosen because the core variables perceived personalization, engagement, and loyalty represent customers' subjective perceptions and behavioral intentions, which cannot be adequately captured through secondary or transactional data alone. The unit of analysis was the individual marketplace user.

The empirical context was Surabaya, Indonesia, a metropolitan city with high digital commerce adoption and intense competition among marketplace platforms, making it a suitable setting for examining loyalty formation under conditions of low switching costs.

The population consisted of consumers residing in Surabaya who actively used digital marketplace platforms such as Shopee, Tokopedia, and Lazada. A purposive sampling technique was applied to ensure respondents had sufficient experience interacting with analytics-driven marketplace features. Respondents were required to meet the following criteria: At least 17 years old, and Have completed a minimum of three marketplace transactions within the last six months. These criteria ensured that respondents were adequately exposed to personalization mechanisms and engagement features supported by big data analytics.

A total of 300 valid responses were collected and analyzed. This sample size exceeds contemporary minimum recommendations for PLS-SEM, particularly for models involving mediation and sequential mediation effects. Recent methodological literature emphasizes that larger samples improve the stability of bootstrapping estimates and the reliability of indirect effect testing in PLS-SEM (Hair et al. 2017; Joe et al. 2014).

Data were collected using a structured online questionnaire distributed via digital channels and community networks. The questionnaire consisted of two sections: (1) respondent demographics, and (2) measurement items for BDA capabilities, perceived personalization, customer engagement, and customer loyalty.

All constructs were measured using multi-item scales adapted from validated international studies, with minor contextual adjustments to fit the digital marketplace setting. Responses were recorded on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree).

To enhance data quality, responses were screened for completeness, consistency, and eligibility compliance. Only valid responses were retained for analysis. Procedural remedies such as anonymity assurance and neutral item wording were applied to mitigate potential common method bias, in line with recent recommendations (Podsakoff et al. 2003)

Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0 software. PLS-SEM was selected due to its suitability for prediction-oriented research, its ability to handle complex models with multiple mediators, and its robustness to non-normal data distributions (Hair et al. 2022). The analysis followed a two-stage procedure:

1. Measurement Model Assessment

Reliability and validity were evaluated through indicator loadings, Composite Reliability (CR), and Average Variance Extracted (AVE). Discriminant validity was assessed using the heterotrait-monotrait ratio (HTMT), which is recommended as a more rigorous criterion in recent SEM research (Rönkkö & Cho, 2022)

2. Structural Model and Mediation Analysis

Structural relationships were assessed by estimating path coefficients and their significance using bootstrapping with 5,000 resamples. The model's explanatory power was evaluated using R^2, while predictive relevance was assessed using the Stone–Geisser Q^2 statistic. Mediation and sequential mediation effects were confirmed when the bootstrapped confidence intervals for indirect effects did not include zero (Joe et al. 2014).

Sequential mediation was tested to examine whether Big Data Analytics Capability influences Customer Loyalty through an ordered mechanism involving Perceived Personalization and Customer Engagement. In this model, Big Data Analytics Capability is expected to enhance Perceived Personalization, which then increases customer engagement and subsequently strengthens customer loyalty. The sequential indirect effect was assessed using the bootstrapping procedure

in PLS-SEM with 5,000 resamples. The mediation effect was considered significant when the indirect effect was positive, the p-value was below 0.05, and the bootstrapped confidence interval did not include zero. This procedure allows the study to determine whether perceived personalization and customer engagement operate as sequential mechanisms in translating big data analytics capability into customer loyalty.

Hypothesis Development

Big data analytics capabilities enable digital platforms to collect, integrate, and analyze customer data to deliver tailored content, recommendations, and services. When customers consistently experience relevant and customized interactions, they develop a perception that the platform understands and responds to their individual needs. Prior studies indicate that analytics-driven personalization significantly enhances perceived relevance and customer value (Kamel, 2023; Teepapal, 2025).
H1: Big Data Analytics capabilities positively influence perceived personalization.

Beyond personalization, BDA capabilities allow platforms to optimize interaction design, communication timing, and feature deployment, thereby encouraging customers to interact more actively with the platform. Data driven insights enable firms to stimulate customer participation, feedback, and ongoing interaction, which are core dimensions of customer engagement (Gupta & Khan, 2024; Mele & Russo-Spena, 2022)
H2: Big Data Analytics capabilities positively influence customer engagement.

Perceived personalization creates psychological value by reducing search effort, enhancing satisfaction, and strengthening relational bonds. When customers believe that a platform provides uniquely tailored experiences, they are more likely to remain loyal and resist switching to competitors (Gong, 2025; Liu et al. 2024).
H3: Perceived personalization positively influences customer loyalty.

Customer engagement reflects customers' cognitive, emotional, and behavioral investment in interactions with a platform. Engaged customers are more likely to continue using the platform, make repeat purchases, and advocate for the brand, thereby reinforcing loyalty (Malik & Pradhan, 2025; Park, 2025).
H4: Customer engagement positively influences customer loyalty.

From a Resource-Based Theory perspective, BDA capabilities represent strategic resources whose value is realized through customer-facing outcomes rather than direct effects alone. Perceived personalization represents a cognitive affective mechanism, while customer engagement represents a behavioral mechanism through which analytics capabilities translate into loyalty.
H5: Perceived personalization mediates the relationship between big data analytics capabilities and customer loyalty.
H6: Customer engagement mediates the relationship between big data analytics capabilities and customer loyalty.
H7: Perceived personalization and customer engagement sequentially mediate the relationship between big data analytics capabilities and customer loyalty.

The proposed framework conceptualizes Big Data Analytics capabilities as a foundational organizational resource that influences customer loyalty both directly and indirectly. The indirect effects operate through two interconnected mediators: perceived personalization and customer engagement. BDA capabilities first enhance customers' perceptions of personalized treatment, which subsequently stimulates deeper engagement with the platform. This heightened engagement then strengthens customer loyalty. The framework integrates resource-based theory and customer engagement theory to explain how analytics-driven capabilities are transformed into psychological and behavioral outcomes in digital markets.

RESULTS

Based on data from 300 respondents, Tokopedia emerged as the most preferred marketplace, selected by 38.66 percent of respondents, followed by Shopee (22.0 percent), and Lazada and Blibli (each 19.67 percent). In terms of demographics, the majority of respondents were female (78.33 percent). Most respondents belonged to productive age groups, specifically 36–45 years (36.67 percent) and 26–35 years (31.33 percent). Regarding shopping frequency, more than 70 percent of respondents made online purchases at least once per month, with 27.0 percent shopping 1–3 times and 44.66 percent shopping more than four times per month. This profile indicates that the sample is dominated by active digital consumers and adequately represents Indonesia's e-commerce user segment. Respondent characteristics in Table 1.

Based on the results in Table 2, all constructs in this study fulfil the criteria for excellent convergent validity. This is evidenced by outer loading values for all indicators significantly exceeding the minimum threshold of 0.70 (Hair et al. 2019), as well as Composite Reliability (CR) and Average Variance Extracted (AVE) values above the recommended standards of CR > 0.70 and AVE > 0.50 (Fornell & Larcker, 1981). The Big Data Analytics Capability (X) construct demonstrates very strong internal consistency with a CR value of 0.922 and adequate explanatory power for its indicators as shown by an AVE of 0.747. Similarly, Perceived Personalization (M1) (CR = 0.920; AVE = 0.743), Customer Engagement (M2) (CR = 0.932; AVE = 0.774), and Customer Loyalty (Y) (CR = 0.924; AVE = 0.752) all exhibit excellent reliability and convergent validity. These findings indicate that all measurement instruments possess high internal consistency and accurately capture their intended constructs, making them suitable for subsequent structural model analysis.

Table 1. Respondent characteristics

Characteristic	Category	Frequency (n)	Percentage (%)
Preferred Marketplace	Shopee	66	22.00
	Lazada	59	19.67
	Blibli	59	19.67
	Tokopedia	116	38.66
Gender	Male	65	21.66
	Female	235	78.33
Age Group	36–45 years	110	36.67
	26–35 years	94	31.33
	18–25 years	58	19.33
	46–55 years	38	12.67
Monthly Shopping Frequency	<1 time	85	28.33
	1–3 times	81	27.00
	>6 times	67	22.33
	4–6 times	67	22.33

Table 2. Convergent validity results

Construct	Item	Outer Loading	CA	CR	AVE
Big Data Analytics Capability (X)	X1	0.859			
	X2	0.882	0.887	0.922	0.747
	X3	0.862			
	X4	0.855			
Perceived Personalization (M1)	M1.1	0.863			
	M1.2	0.873	0.885	0.920	0.743
	M1.3	0.909			
	M1.4	0.873			
Customer Engagement (M2)	M2.1	0.862			
	M2.2	0.866	0.903	0.932	0.774
	M2.3	0.866			
	M2.4	0.854			
Customer Loyalty (Y)	Y1	0.869			
	Y2	0.867	0.890	0.924	0.752
	Y3	0.866			
	Y4	0.867			

Based on Table 3, the Fornell–Larcker Criterion confirms that the research model satisfies discriminant validity. The square roots of the Average Variance Extracted (AVE), presented on the diagonal, exceed the correlations between constructs in their corresponding rows and columns (Fornell & Larcker, 1981). Specifically, the AVE value for big data analytics capability (0.864) is greater than its correlations with customer engagement (0.889), customer loyalty (0.898), and perceived personalization (0.892). A consistent pattern is observed in the remaining constructs: customer engagement (0.880), customer loyalty (0.867), and perceived personalization (0.862) all exhibit AVE values that surpass their inter-construct correlations. These results demonstrate that each construct explains more variance in its own indicators than in those of other constructs, confirming that the constructs are empirically distinct and discriminately valid.

Based on Table 4, the F-Square values indicate the magnitude of the exogenous constructs' contribution to the endogenous constructs. According to Cohen (1988), the F-Square values for customer engagement (0.236) and perceived personalization (0.327) fall within the medium category, while big data analytics capability (3.766) reflects a very large effect size. Regarding R-Square, the model demonstrates substantial explanatory power following Chin's (1998) classification. Customer engagement (M2) has an R-Square of 0.790 (Adjusted = 0.789), customer loyalty (Y) reaches 0.839 (Adjusted = 0.838), and perceived personalization (M1) attains 0.796 (Adjusted = 0.796). These results confirm that the model explains a considerable proportion of variance in the endogenous variables. Overall, the findings highlight the dominant contribution of big data analytics capability to customer engagement, perceived personalization, and customer loyalty. This aligns with Hair et al. (2019), who emphasize that high R-Square values coupled with substantial F-Square scores indicate strong predictive validity.

Based on the results presented in Table 5, all direct and indirect relationships in the research model are statistically significant ($p < 0.001$). The direct effect of big data on customer engagement is exceptionally strong and significant ($\beta = 0.889$, $t = 92.529$, $p < 0.001$). Likewise, big data exerts a strong direct effect on perceived personalization ($\beta = 0.892$, $t = 93.590$, $p < 0.001$). Furthermore, both Customer Engagement ($\beta = 0.433$, $t = 8.639$, $p < 0.001$) and Perceived Personalization ($\beta = 0.509$, $t = 10.423$, $p < 0.001$) demonstrate significant and positive direct effects on customer loyalty.

The mediation analysis further reveals significant indirect mechanisms. Big data exerts an indirect effect on customer loyalty through customer engagement ($\beta = 0.385$, $t = 8.489$, $p < 0.001$). Additionally, perceived personalization significantly mediates the relationship between big data and customer loyalty ($\beta = 0.454$, $t = 10.092$, $p < 0.001$). These findings indicate that, beyond its direct influence, big data also enhances customer loyalty by increasing customer engagement and strengthening perceived personalization.

Table 3. Discriminant Validity Assessment Using the Fornell–Larcker Criterion

Construct	Big Data Analytics Capability (X)	Customer Engagement (M2)	Customer Loyalty (Y)	Perceived Personalization (M1)
Big Data Analytics Capability (X)	0.864			
Customer Engagement (M2)	0.889	0.880		
Customer Loyalty (Y)	0.898	0.887	0.867	
Perceived Personalization (M1)	0.892	0.893	0.895	0.862

Table 4. F-Square and Q-Square Results

Construct	F-Square	R-Square	Adjusted R-Square
Customer Engagement (M2)	0.236	0.790	0.789
Customer Loyalty (Y)		0.839	0.838
Perceived Personalization (M1)	0.327	0.796	0.796
Big Data Analytics Capability (X)	3.766		

Table 5. Direct and indirect effects

Relationship	Original Sample (O)	Sample Mean (M)	STDEV	T Statistic	P Value	Conclusion
Big Data → Customer Engagement	0.889	0.889	0.010	92.529	0.000	H1 Supported
Big Data → Perceived Personalization	0.892	0.893	0.010	93.590	0.000	H2 Supported
Customer Engagement → Customer Loyalty	0.433	0.431	0.050	8.639	0.000	H3 Supported
Perceived Personalization → Customer Loyalty	0.509	0.511	0.049	10.423	0.000	H4 Supported
Big Data → Customer Engagement → Customer Loyalty	0.385	0.383	0.045	8.489	0.000	H5 Supported
Big Data → Perceived Personalization → Customer Loyalty	0.454	0.456	0.045	10.092	0.000	H6 Supported
The sequential indirect effect of Big Data Analytics Capability on Customer Loyalty through Perceived Personalization and Customer Engagement	0.138	0.139	0.026	5.308	0.000	Supported

The results of the first hypothesis test (H1) indicate that big data has a positive and significant effect on customer engagement (B = 0.889; T = 92.529; p < 0.001). This finding suggests that the more effectively big data is utilized, the higher the level of customer engagement that can be achieved by the company. Big Data equips organizations with the ability to understand consumer behavior more accurately, thereby enhancing continuous interaction and customer involvement. This result aligns with prior studies asserting that Big Data analytics strengthens customer firm interaction by enabling a deeper understanding of customer needs and preferences (Kamel, 2023; Tetteh et al. 2025).

The second hypothesis (H2) is also supported, demonstrating that big data has a positive effect on perceived personalization (B = 0.892; T = 93.590; p < 0.001). This result confirms that the use of Big Data allows firms to design more targeted service personalization strategies. With large-scale and integrated data, companies can create offerings tailored to individual customer preferences. Previous studies support this finding, emphasizing that Big Data analytics plays a major role in crafting relevant and personalized customer experiences, which in turn enhances satisfaction (Cherenkov et al. 2024; Giannakopoulos et al. 2024).

Furthermore, the third hypothesis test (H3) shows that customer engagement has a positive effect on loyalty (B = 0.433; T = 8.639; p < 0.001). This indicates that the higher the level of customer engagement with a brand or service, the stronger the loyalty that emerges. Customer engagement is a crucial factor in establishing long-term emotional bonds with a company. This finding is consistent with earlier research highlighting customer engagement as a primary determinant in the formation of customer loyalty (Nguyen Thi Khanh & Nguyen, 2022; Ting et al. 2021).

The fourth hypothesis (H4) is also supported, revealing that perceived personalization positively influences loyalty (B = 0.509; T = 10.423; p < 0.001). This finding underscores that personalization not only enhances customer experience but also strengthens long-term loyalty. The more personalized the services provided, the greater the likelihood that customers will remain and continue using the company's products or services. This result aligns with studies showing that data-driven personalization increases satisfaction, reduces rebranding intentions, and promotes customer loyalty (Mohapatra et al. 2025).

The fifth hypothesis test (H5) demonstrates that big data positively affects loyalty through customer engagement (B = 0.385; T = 8.489; p < 0.001). This finding suggests that big data not only exerts a direct effect on loyalty but also an indirect effect through increased customer engagement. Thus, Customer Engagement functions as a mediating mechanism that amplifies the influence of Big Data on customer loyalty. Prior research also supports this conclusion, noting that Customer Engagement serves as an essential pathway linking data driven strategies with enhanced customer loyalty (Ahmad et al. 2022; Magableh et al. 2024).

Finally, the sixth hypothesis (H6) is supported, indicating that big data positively affects loyalty through perceived personalization (B = 0.454; T = 10.092; $p < 0.001$). This result shows that the use of Big Data promotes the creation of more effective service personalization, which subsequently strengthens customer loyalty. This finding is consistent with studies revealing that personalization driven by Big Data-based analytics enhances customer retention while reinforcing a firm's competitive advantage (Dahiya et al. 2022; Fast et al. 2023).

The sequential indirect effect of big data analytics capability on customer loyalty through perceived personalization and customer engagement is also significant, with a coefficient of 0.138, t-statistic of 5.308, and p-value of 0.000. This result indicates that big data analytics capability enhances customer loyalty through an ordered psychological and behavioral process. big data analytics capability first strengthens customers' perception of personalized service, perceived personalization then stimulates customer engagement, and customer engagement subsequently increases customer loyalty.

The findings of this study indicate that Big Data Analytics Capability contributes to Customer Loyalty not merely as a technological capability, but as an organizational resource that must be transformed into customer-perceived value. This means that the availability of large-scale customer data, analytical tools, and data processing capability does not automatically create loyal customers. Instead, Big Data Analytics Capability becomes strategically meaningful when customers experience its benefits through relevant recommendations, personalized offers, individualized communication, and more engaging digital interactions. This result provides an important theoretical explanation of how analytics capability operates in digital marketplaces. From the perspective of Resource Based Theory, Big Data Analytics Capability represents a valuable organizational resource. However, the value of this resource is not fully realized at the customer level unless it is converted into meaningful customer experiences. Perceived Personalization plays this role by translating analytics-driven decisions into psychological value. When customers perceive that a marketplace understands their preferences and provides relevant services, they are more likely to develop positive evaluations of the platform.

Customer engagement further explains the behavioral mechanism through which personalization contributes to loyalty. Personalized experiences can stimulate customers to interact more actively with platform features, revisit the marketplace, respond to recommendations, provide feedback, and maintain ongoing relationships with the platform. Thus, engagement reflects a deeper relational process that connects personalized digital experiences with loyalty outcomes.

This interpretation is particularly relevant in digital marketplace contexts, where switching costs are low and customers can easily move to competing platforms. Under such conditions, customer loyalty depends not only on functional benefits, price promotions, or transaction convenience, but also on whether customers feel understood and remain actively engaged with the platform. Therefore, big data analytics capability should be understood as a strategic enabler of loyalty formation only when it is integrated with personalization and engagement strategies.

This study provides several theoretical contributions. First, it extends the big data analytics literature by explaining how big data analytics capability influences customer loyalty through customer level psychological and behavioral mechanisms rather than only through firm level performance outcomes. Second, this study contributes to resource based theory by demonstrating that the strategic value of big data analytics capability is realized when analytical resources are transformed into customer-perceived benefits, particularly perceived personalization and customer engagement. Third, this study enriches customer engagement theory by positioning customer engagement as a behavioral relational mechanism that links personalized digital experiences with customer loyalty. Finally, this study offers theoretical novelty by integrating big data analytics capability, perceived personalization, customer engagement, and customer loyalty into a dual and sequential mediation model. This model explains that customer loyalty in digital marketplaces is formed through interconnected psychological and behavioral pathways.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study aimed to analyse the influence of big data on customer engagement, personalization, and customer loyalty, as well as examine the mediating roles of customer engagement and personalization in these relationships. The results show that all hypotheses (H1–H6) are supported. First, big data has a positive effect on customer engagement and personalization, reaffirming the importance of leveraging data to create customer involvement and relevant service experiences. Second, customer engagement and personalization are shown to positively influence customer loyalty, strengthening their roles as key determinants in building long-term customer relationships. Third, the findings demonstrate that customer engagement and personalization mediate the influence of big data on loyalty, confirming that big data affects loyalty not only directly but also through deeper customer relationship mechanisms. Theoretically, this study enriches the literature on the role of big data in customer-centric marketing strategies by adding insights into the mediating roles of customer engagement and personalization. From a practical perspective, the findings imply that companies should invest in the development of big data infrastructure and integrate it with engagement strategies and personalized services. This is essential for fostering stronger and more sustainable customer loyalty within an increasingly competitive and dynamic business environment.

Recommendations

The study used a cross-sectional design, which has limitations in establishing causal relationships. In addition, data collection relies on online questionnaires that are filled out by respondents independently, so they are susceptible to response bias. The sampling approach is limited to marketplace users in Surabaya using purposive sampling techniques; As a result, the findings may not be representative of users in other regions or with different demographic characteristics. In addition, the study did not conduct specific comparative analyses between different platforms or product categories To expand on these findings, future studies should prioritize expanding regional coverage and respondent diversity to make the results more generalizable, as well as integrating with other variables such as trust, satisfaction, quality of digital services, and perceptions of privacy to determine how these variables affect loyalty. A mixed-methods strategy could also yield richer insights by combining interview methods or focus group discussions (FGDs) and conducting comparative analyses between platforms and product categories to provide a more nuanced picture of the complex relationships among variables such as personal experience, customer engagement, and loyalty.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to ITEBIS PGRI Dewantara Jombang for the institutional support and facilities provided during the completion of this research.

CONFLICTS OF INTEREST: The authors declare no conflict of interest.

FUNDING STATEMENT: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

DECLARATION OF GENERATIVE AI STATEMENT: During the preparation of this work the authors used ChatGPT to check grammar and polish text. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication. The declaration does not apply to the use of basic tools, such as tools used to check grammar, spelling and references. If you have nothing to disclose, you do not need to add a statement.

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