

The Influence of Data Security and Consumer Privacy on Trust and Purchase Intention in Marketplaces with Risk Perception as a Moderating Variable

Hulwatul Adzro¹, Ibrahim Fanji Dipura¹, Fitri Aditri¹, Neni Alyani^{1,2}, M Miftahul Madya^{1*}

¹Lembaga Riset AI Creation (LRAC), Depok, Indonesia

²Institut Pemerintahan Dalam Negeri, Sumedang, Indonesia

*corresponding author: mmiftahulm29@gmail.com

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Abstract:

The rapid growth of e-commerce has increased concerns regarding data security and consumer privacy in marketplace platforms. These issues are closely related to consumer trust and online purchase intention, with risk perception playing a potential moderating role. This study aims to analyze the influence of data security and consumer privacy on consumer trust and its impact on purchase intention, incorporating risk perception as a moderating variable. A quantitative approach was employed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with data collected from 100 respondents through a five-point Likert scale questionnaire. The results indicate that several indicators do not meet validity and reliability criteria, as reflected in low outer loading, AVE, Cronbach’s Alpha, and composite reliability values. Consequently, the proposed relationships among variables cannot be fully validated. The study concludes that improving measurement instruments is essential to obtain more accurate and reliable results in future research.

Abstrak:

Pertumbuhan pesat e-commerce meningkatkan kekhawatiran terkait keamanan data dan privasi konsumen pada platform marketplace. Isu ini berkaitan erat dengan kepercayaan konsumen dan niat pembelian online, dengan persepsi risiko sebagai variabel moderasi. Penelitian ini bertujuan menganalisis pengaruh keamanan data dan privasi konsumen terhadap kepercayaan serta implikasinya terhadap niat pembelian, dengan memasukkan persepsi risiko sebagai variabel moderasi. Penelitian menggunakan pendekatan kuantitatif dengan metode Structural Equation Modeling–Partial Least Squares (SEM-PLS) terhadap 100 responden menggunakan kuesioner skala Likert lima poin. Hasil penelitian menunjukkan bahwa beberapa indikator belum memenuhi kriteria validitas dan reliabilitas, yang ditunjukkan oleh nilai outer loading, AVE, Cronbach’s Alpha, dan composite reliability yang rendah. Oleh karena itu, hubungan antar variabel belum dapat disimpulkan secara optimal. Penelitian ini menekankan pentingnya perbaikan instrumen pengukuran untuk memperoleh hasil yang lebih akurat dan reliabel.

1. INTRODUCTION

The rapid development of information and communication technology has significantly driven the growth of electronic commerce activities, particularly through marketplace platforms. Ease of access, product variety, and transaction efficiency are key factors attracting consumers to engage in online shopping. However, alongside these advantages, concerns regarding data security and consumer privacy have increased due to the rising number of data breaches and misuse of personal information. Data security is a crucial aspect in maintaining the integrity and confidentiality of user information, while consumer privacy relates to the protection of personal data stored by marketplace platforms [1], [2].

Consumer trust is a key factor in determining the success of online transactions. Consumers are more likely to make purchases when they believe that a marketplace can provide secure and reliable services. In addition, purchase intention is influenced by consumers' perceptions of risks that may arise during the transaction process. Risk perception includes the possibility of financial loss, data leakage, and uncertainty regarding product quality [3]. Therefore, examining the relationship between data security, consumer privacy, trust, and purchase intention

is essential in the context of marketplace platforms.

Several previous studies have examined the relationships among variables using Structural Equation Modeling based on Partial Least Squares (SEM-PLS), which is widely recognized for its ability to analyze complex relationships among latent constructs and its suitability for predictive and exploratory research models. The information systems success model highlights the importance of system quality, including security and reliability, in shaping user trust and behavioral outcomes [4], while other studies emphasize that trust and perceived risk jointly influence online consumer decision-making [5]. Empirical applications of SEM-PLS have been widely implemented across various domains. One study demonstrates that SEM-PLS can effectively analyze factors influencing the acceptance and sustainability of digital technology use in education, revealing the significance of communication, ease of use, and continued intention [6]. Another study shows that perception and knowledge significantly affect competence development in data-driven learning environments, supported by strong validity and reliability measures [7]. In a socio-cultural context, further research confirms that SEM-PLS can model complex relationships among leadership, cultural intelligence, and social

adaptation in shaping tolerance within multicultural communities [8]. Moreover, other findings indicate that program quality and mentor support significantly influence work readiness, with technology usage acting as a moderating variable [9]. Additional research reveals that promotion and social influence affect online purchase decisions, both directly and indirectly through convenience as a mediating variable [10]. Other studies indicate that service awareness and management quality significantly influence user interest and behavioral outcomes, demonstrating the robustness of SEM-PLS in behavioral studies [11]. It is also found that work environment and motivation impact work readiness through competence mediation [12]. In the context of digital transformation, studies show that technology readiness significantly affects the adoption of generative AI and improves startup performance [13]. Supporting this, further research identifies that digital capability contributes to innovation capability and operational efficiency, although some indicators still require improvement in validity [14]. Additionally, perceived ease of use has been found to influence generative AI adoption and contribute to enhancing competitive advantage in digital startups [15]. Furthermore, recent research in the field of chemistry education demonstrates that SEM-PLS can be effectively utilized to analyze cognitive variables related to method validation,

showing that conceptual understanding of validation objectives, parameters such as accuracy and precision, and chemometric knowledge significantly influence the implementation of analytical method validation [16]. In addition, recent studies in chemometric analysis highlight that the implementation of simple technology influences spectral data analysis quality, although its effectiveness depends on users' data literacy [17]. Other findings indicate that simple technology implementation affects spectral preprocessing accuracy, but measurement limitations still influence the structural model evaluation [18]. Furthermore, research shows that simple technology can improve statistical understanding, although its effect on more complex analytical tasks such as outlier detection remains limited [19]. Collectively, these studies confirm that SEM-PLS is a robust and flexible analytical approach for examining direct, mediating, and moderating relationships across various research contexts, including consumer behavior, technology adoption, and digital transformation.

Although numerous studies have been conducted, several gaps still need to be addressed. Previous research has largely focused on examining the direct relationships between technological and behavioral factors and user outcomes, with relatively limited attention given to the combined role of data security and

consumer privacy as key determinants of trust within a single integrated framework. Moreover, while perceived risk is frequently acknowledged as a crucial factor in online consumer behavior, its function as a moderating variable in the relationship between trust and purchase intention has not been thoroughly investigated. In addition, inconsistencies across prior findings suggest that the interplay between security, privacy, and risk perception in influencing consumer trust and behavioral intention remains unclear and requires further empirical examination, particularly in marketplace contexts. Therefore, this study seeks to investigate the impact of data security and consumer privacy on consumer trust and its subsequent effect on online purchase intention, by incorporating perceived risk as a moderating variable. The findings are expected to enrich the existing literature by offering a more integrated model and to provide practical implications for enhancing data protection and security strategies in marketplace platforms.

2. METHOD

This research adopts a quantitative approach utilizing Structural Equation Modeling based on Partial Least Squares (SEM-PLS) to examine the relationships among the proposed variables. SEM-PLS is chosen because of its effectiveness in analyzing complex models with

multiple latent constructs and its suitability for predictive-oriented studies, especially when working with relatively limited sample sizes [20], [21]. The model developed in this study investigates the effect of data security and consumer privacy on consumer trust and online purchase intention, while incorporating risk perception as a moderating variable. The measurement indicators for each construct are not elaborated narratively, as they are presented in a dedicated table.

Data collection was carried out a survey using a structured questionnaire distributed to 100 respondents who have prior experience using marketplace platforms. The sampling method applied is purposive sampling, a type of non-probability sampling, where respondents are selected based on specific criteria aligned with the research objectives. A five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5), is used to capture respondents' perceptions and attitudes, as it is widely recognized for measuring behavioral constructs in quantitative research [22].

Table 1 Variable, Definition, and Indicator

Variable	Type	Code	Indicator
Data Security (SEC)	Independent	SEC1	Protection of users' personal data
		SEC2	Security of transaction information
		SEC3	System reliability in safeguarding data

Consumer Privacy (PRIV)	Independent	PRIV1	Confidentiality of personal information
		PRIV2	User control over personal data
		PRIV3	Protection against unauthorized third-party access
Risk Perception (RISK)	Moderating	RISK1	Risk of data loss
		RISK2	Risk of transaction fraud
		RISK3	Uncertainty in online transactions
Customer Trust (TRUST)	Dependent	TRUST 1	Trust in system security
		TRUST 2	Confidence in marketplace reliability
		TRUST 3	Trust in data protection
Purchase Intention (PI)	Dependent	PI1	Intention to purchase products on the marketplace
		PI2	Willingness to transact in the future
		PI3	Likelihood of making repeat purchases

The analysis procedure follows the SEM-PLS framework, which consists of evaluating both the measurement model (outer model) and the structural model (inner model). The measurement model assessment aims to ensure the validity and reliability of the constructs by examining several criteria, including outer loading, Variance Inflation Factor (VIF), Average Variance Extracted (AVE), Cronbach's Alpha, and composite reliability (ρ_c). These evaluation metrics are commonly applied to confirm convergent validity,

internal consistency, and the absence of multicollinearity among indicators [20], [23].

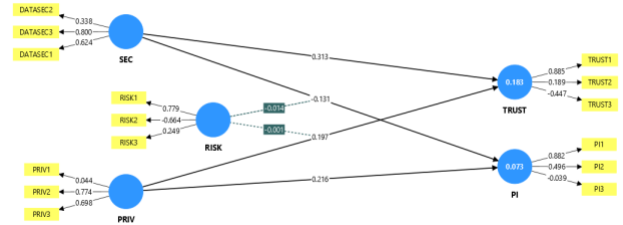


Fig. 1 Model Diagram and Intervariable Relationship

Subsequently, the structural model evaluation is conducted to analyze the relationships between latent variables and to test the proposed hypotheses. The moderating role of risk perception is assessed to determine its influence on the relationship between consumer trust and online purchase intention. SEM-PLS enables the simultaneous examination of both direct and moderating effects within a single analytical model [21], [24]. The findings of this study are expected to provide empirical insights into how data security and consumer privacy contribute to building trust and shaping consumers' purchase intentions in marketplace environments.

3. RESULT AND DISCUSSION

The results of this study reveal several important findings related to the measurement model (outer model) evaluation using SEM-PLS. Based on the analysis of outer loading values, it is evident that not all indicators meet the recommended threshold of 0.70 for convergent validity. Several

indicators such as SEC2 (0.338), PRIV1 (0.044), RISK2 (-0.664), TRUST3 (-0.447), and PI3 (-0.039) fall below the acceptable limit, indicating weak contributions to their respective constructs. According to SEM-PLS standards, indicators with low loading values should be reconsidered or removed, as they may reduce the overall validity of the model [25]. Only a few indicators, such as SEC3 (0.800), PRIV2 (0.774), RISK1 (0.779), TRUST1 (0.885), and PI1 (0.882), demonstrate acceptable levels of convergent validity.

Furthermore, the Average Variance Extracted (AVE) values for all constructs are below the recommended threshold of 0.50, with values such as 0.381 (SEC), 0.363 (PRIV), 0.370 (RISK), 0.339 (TRUST), and 0.342 (PI). These results indicate that the constructs fail to adequately explain the variance of their indicators, suggesting poor convergent validity at the construct level [26]. In addition, the reliability analysis shows that Cronbach's Alpha values for all constructs are below the acceptable threshold of 0.70, and even include negative values (e.g., PRIV = -0.087, RISK = -0.300, TRUST = -0.103), which strongly indicates internal inconsistency among the indicators. Similarly, composite reliability (ρ_c) values are also below the recommended level, further confirming that the measurement model is not reliable [25].

Despite these limitations, the Variance Inflation Factor (VIF) values for all indicators are

within acceptable limits ($VIF < 5$), indicating that there is no multicollinearity issue among the indicators. This suggests that although the indicators are not strongly valid or reliable, they do not exhibit redundancy or excessive correlation with one another [27]. Additionally, the moderating construct (interaction terms between RISK and independent variables) shows a value of 1.000, which indicates a perfect or artificially constructed interaction term, commonly found in moderation analysis using product indicators in SEM-PLS [28].

These findings highlight a significant gap between the theoretical model proposed in the introduction and the empirical results obtained. While prior studies emphasize the importance of data security and consumer privacy in building trust and influencing purchase intention, the current results indicate that the measurement instruments used in this study have not yet achieved sufficient validity and reliability. This inconsistency may be caused by several factors, including poorly formulated questionnaire items, limited sample size, or respondents' lack of understanding of the constructs being measured [25], [26]. Therefore, before proceeding to structural model evaluation, it is necessary to refine the measurement model by removing invalid indicators, revising questionnaire items, and potentially increasing the sample size to improve the robustness of the results.

In relation to the research objectives, the inability of the constructs to meet validity and reliability criteria implies that the relationships between data security, consumer privacy, trust, risk perception, and purchase intention cannot be interpreted conclusively at this stage. This finding is important because it suggests that the moderating role of risk perception, which was expected to strengthen or weaken the relationship between trust and purchase intention, cannot be properly tested without a valid measurement model. This aligns with previous methodological studies stating that a valid and reliable outer model is a prerequisite for meaningful structural model analysis in SEM-PLS [26], [28].

Construct & Indicator	Loading Factor	AVE	Cronbach's Alpha	rho_c	VIF
SEC		0.381	0.231	0.626	
SEC1	0.624				1.057
SEC2	0.338				1.045
SEC3	0.800				1.016
PRIV		0.363	-0.087	0.546	
PRIV1	0.044				1.043
PRIV2	0.774				1.015
PRIV3	0.698				1.058
RISK		0.370	-0.300	0.065	
RISK1	0.779				1.026
RISK2	-0.664				1.022
RISK3	0.249				1.008
TRUST		0.339	-0.103	0.166	
TRUST1	0.885				1.000
TRUST2	0.189				1.005
TRUST3	-0.447				1.005
PI		0.342	0.226	0.476	
PI1	0.882				1.067
PI2	0.496				1.014
PI3	-0.039				1.062
RISK x PRIV	1.000				1.000

Construct & Indicator	Description
SEC	Not valid and not reliable
SEC1	Valid
SEC2	Not valid
SEC3	Valid
PRIV	Not valid and not reliable
PRIV1	Not valid
PRIV2	Valid
PRIV3	Valid
RISK	Not valid and not reliable
RISK1	Not valid
RISK2	Valid
RISK3	Valid
TRUST	Not valid and not reliable
TRUST1	Valid
TRUST2	Not valid
TRUST3	Not valid
PI	Not valid and not reliable
PI1	Valid
PI2	Not valid
PI3	Not valid

Overall, this study provides an important methodological contribution by highlighting the challenges in measuring consumer perceptions related to data security and privacy in marketplace contexts. The findings emphasize the need for improving instrument design and validation procedures in future research. Practically, marketplace providers should also be aware that consumers' perceptions of security and privacy are complex and may not be easily captured through simple measurement items, requiring more comprehensive and context-specific approaches.

4. CONCLUSION

This study aimed to examine the influence of data security and consumer privacy on consumer trust and online purchase intention, with risk

perception as a moderating variable, using the SEM-PLS approach. The findings indicate that the measurement model has not yet achieved adequate validity and reliability, as reflected by low outer loading, AVE, Cronbach's Alpha, and composite reliability values. As a result, the proposed relationships among variables cannot be interpreted conclusively. These results highlight the importance of improving measurement instruments and ensuring construct validity before proceeding to structural model analysis. Future research is recommended to refine the indicators, increase sample size, and enhance data quality to obtain more robust and reliable findings.

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