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Toward Safer E-Commerce Transactions: The Influence of System Quality, Information Accuracy, and Government Oversight

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Article history
Received 16 November 2024 | Accepted 19 December 2024 | Published online 30 December 2024.

Abstract
The transition from traditional to online shopping has sped up the expansion of e-commerce, which requires strong consumer protection measures to guarantee safety and convenience. This survey aims to determine the role of system quality, information quality, service quality, and government regulation on e-commerce usage. Using a quantitative approach, an online survey questionnaire was conducted among 428 e-commerce consumers. Structural equation modeling (SEM) indicates that system quality, information quality, and government regulation have a positive effect on usage behavior while service quality has a negative effect on usage behavior. To improve public knowledge about transaction security in e-commerce, thorough socialization and education are needed, targeting all parties involved in online transactions, including marketplaces, payment providers, and delivery services. Additionally, improvements in service quality are crucial for minimizing consumer issues.

Keywords: Consumer protection, DeLone & McLean model, e-commerce usage, government regulation.

JEL classification: L86, D83, K29.

Introduction

E-commerce's rapid growth in Indonesia, driven by technological advancements and increasing consumer engagement, necessitates a robust regulatory framework to address critical issues, such as consumer protection and data security. Currently, several regulations in Indonesia govern e-commerce, namely Regulation No. 71/2019 by the government regarding the Execution of Electronic Systems and Transactions and Regulation No. 80/2019 on Trading via Electronic Systems. However, these regulations have not guaranteed the safety and comfort of consumers, particularly when transacting through e-commerce. Leakage of consumer personal data is one of the many problems that often arise (Wijanarko and Fachrodji, 2020; Muneer, Razzaq, and Farooq, 2018); for example, the leakage of Tokopedia and Lazada platforms data in 2021. Millions of e-commerce accounts in May 2020 were allegedly leaked, with hackers selling Tokopedia's database of 91 million accounts for US$ 5,000 on the dark web. Meanwhile, Lazada experienced a leak of 1.1 million data points. The types of problems that occur in the e-commerce sector include defaults on the delivery of goods (41%), unsuitable goods (15%), defective or damaged goods (15%), and problems in refunding goods (15%).

This issue is connected to data leakage, and the rise in online transactions frequently does not lead to an enhancement in service quality within e-commerce systems. The Indonesian Ministry of Trade highlights that the proportion of consumer complaint services linked to e-commerce transactions remains predominant, reaching 6,911 services, which accounts for 93 percent of all incoming consumer services in 2022. By 2022, the e-commerce sector had the highest at 9,393 consumer complaints (Ministry of Trade Republic of Indonesia, 2023).

Moreover, e-commerce increases the number of consumer transactions, ultimately increasing economic growth and contributing 60% of Indonesia's GDP. To implement e-commerce information technology systems to provide consumer satisfaction so that trust in transactions grows, a model is required to identify the ideal elements in terms of the security and convenience of e-commerce. Therefore, studying e-commerce systems is crucial to safeguard consumers in Indonesia. Various researchers have performed studies on the effectiveness of e-commerce systems utilizing the DeLone and McLean models (Angelina, Hermawan, and Suroso, 2019; Cui et al., 2019; Ojo, 2017; Rouibah, Lowry, and Almutairi, 2015).

Researchers have developed numerous models to account for the success of Information Systems (IS). Technology Acceptance Model employs the Theory of Reasoned Action to clarify why certain information systems are accepted by users more easily than others (Davis, 1989). Nevertheless, acceptance does not equal success, although it is a necessary condition for acceptance of information systems. To address this concern, DeLone and McLean (1992) examined studies released between 1981 and 1987 and developed a classification of IS success based on this analysis.

This research is a development model from other researchers such as Shannon and Weaver (1964), where the technical level explains how precise and efficient a system is in creating information, the semantic level relates to the successful delivery of information, while the effectiveness level deals with the effect of information on the recipient. According to Mason (1978), there is a theory called the information “Influence” theory which focuses on the term “Influence” of information which Mason then modified the term effectiveness into influence. For Mason, the Influence Level can be defined as the level of events occurring at the receiving endpoint of the information system. This degree of influence includes its subordinate events: receiving information, assessing information, and utilizing information, which affect a recipient, the system that indicates the achievement success category level (Mason, 1978; Shannon and Weaver, 1964). Subsequently, DeLone and McLean (1992) employed this model for the same objective - to model their success. The DeLone and McLean model, first introduced in 1992 and updated in 2003, includes six primary factors: system quality, information quality, service quality, usage, user satisfaction, and benefits (DeLone and McLean, 2003). In this research, the model was modified to include an additional variable: government regulation.

System quality refers to how well a system operates, relying on a combination of hardware and software in an information system. This is associated with ease of use, accessibility, and user acceptance (Khan and Qutab, 2016). Consumers tend to reuse systems that meet their satisfaction levels (Febrian, Simanjuntak, and Hasanah, 2021). Repeated use signifies that a system is perceived as beneficial (Xuanzhi and Ahmad, 2019). This study adopted five indicators from earlier research to asses system quality in e-commerce: ease of use, ease of learning (Cui, 2019), security (Rouibah, Lowry, and Almutairi, 2015), access convenience, and command language (Iivari, 2005). In India, web service quality has been evaluated based on 14 four-factor WEBQUAL items (Ahmad and Khan, 2017).

Information quality is based on consumers' perceptions of the content displayed on m-commerce applications. The two key dimensions of information quality are content adequacy (including reliability, adequacy, and completeness) and usability (informativeness and value) (Duy and Dai, 2018). For consumers to consistently use e-commerce platforms, information must be complete, relevant, and easy to understand. Information quality is typically measured using relevance, the output format, clarity, and comprehensibility (Rouibah, Lowry, and Almutairi, 2015). Information must come from reliable, verified sources, and should meet standards for accuracy, reliability, and timeliness (Jusop, Ismail, and Ismail, 2020).

Service quality indicates how well consumers' views of a service match or exceed their expectations (Sampson, Etuk, and Usani, 2022). Service quality is essential for e-commerce platforms' success (DeLone & McLean, 2004). This indicates total assistance provided by the information system. Five dimensions are frequently utilized to evaluate service quality in e-commerce: design (Ali and Bhasin, 2019), reliability of performance (Tandon, Kiran, and Sah, 2017), service timeliness (Agrawal, Tripathi, and Agrawal 2018), trustworthiness (Sundaram, Ramkumar, and Shankar, 2017), and customization (Malik et al., 2016). In e-commerce, quality of service is frequently evaluated by monitoring the orders and promptness of online assistance (Duy and Dai, 2018).

Government regulations have played a key role in supporting the growth and sustainability of e-commerce ecosystems in Indonesia. These regulations are essential to protect consumers during the transaction process. Both central and local governments must encourage e-commerce adoption through various policy interventions (Hasan et al., 2021). Developing countries can greatly benefit from e-commerce by addressing regulatory barriers (Singhal, Mittal, and Agarwal, 2019). However, countries such as Algeria face challenges owing to the lack of comprehensive regulatory frameworks that protect stakeholders' rights in e-commerce (Chaabna and Wang, 2015). E-government service quality is often measured by efficiency, ease of completion, system availability, and convenience, all of which significantly affect user satisfaction (Tetteh, 2022).

In Indonesia, trust in sellers remains a central principle in e-commerce transactions, whereas security infrastructure is less of a concern for consumers (Damuri, 2020). However, studies show that improving security and trust is critical for e-commerce growth (Saeed, 2023). Consumer trust is influenced by various usability and security dimensions (Mohd and Zaaba, 2019). This study also highlights numerous issues in the Indonesian e-commerce sector, such as delivery defaults, refunds, defective goods, phishing, and misrepresentation (e.g., fictitious stores and incorrect product descriptions).

This research investigates consumer behavior in e-commerce utilizing the DeLone and McLean model. Research has demonstrated that both the quality of a system and the quality of information significantly affect consumer behavior (Al-Fraihat et al. 2020). For instance, the perceived simplicity of the e-commerce platform positively influences consumers' willingness to embrace mobile commerce (Sair and Danish, 2018). In addition, the quality of systems and information is connected to improved satisfaction and net benefits (Ali et al, 2018). In this regard, the inclusion of the government regulation aspect in the model offers a better understanding towards the determinants of e-commerce growth.

This study propose the following research hypotheses:
H1: System quality significantly affects usage.
H2: Information quality significantly affects usage.
H3: Service quality significantly affects usage.
H4: Government regulation significantly affects usage.
The detailed research framework is shown in Figure 1.

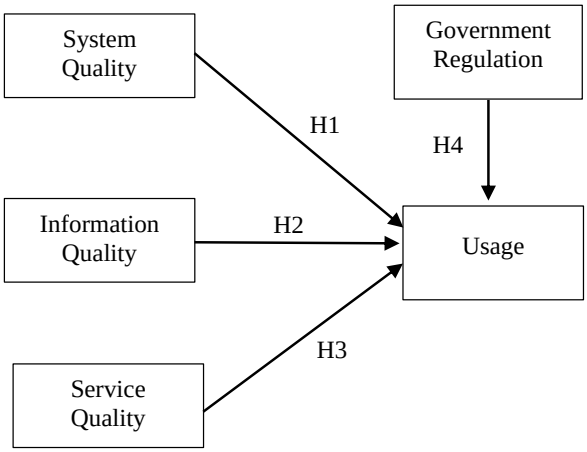

Figure 1. Research framework

1. Methodology

This research utilized a quantitative method featuring a descriptive design, employing an online questionnaire. Quantitative research evaluates objective theories by exploring the connections among the variables. The study group included consumers who utilized e-commerce as their method of shopping. The sample was chosen using voluntary sampling methods according to the criteria for Indonesian citizens who made online purchases. The total number of participants in the sample was 300. This illustration was adjusted according to Hair et al. 's (2017) perspective that the sample size must be ≥ 100. A total of 428 participants were involved in the survey. The tool utilized in this research was an online survey created with Google Forms, shared as links on social media platforms.

Six variables were examined: system quality (X1), information quality (X2), service quality (X3), usage (Y) (Dalle et al., 2020; Wang, Cao, and Yang, 2010; DeLone and McLean, 2003); and governmental regulation (X4) (Damuri, 2020). The tool comprised 28 items evaluated on a five-point Likert scale: (1) strongly disagree, (2) disagree, (3) somewhat agree, (4) agree, and (5) strongly agree. The testing of the instrument, involving 30 participants not part of the main study, indicated that all variables were dependable (Table 1).

Table 1. Reliability test of research instruments

Variables	Number of Indicators	*Cronbach's alpha*
System Quality	6	0.901
Information Quality	3	0.753
Service Quality	14	0.668
Government Regulation	3	0.604
Usage	2	0.829

The operational definitions of the variables studied, including the indicators used (Table 2).

Table 2. Operational definitions of variables and indicators

Variables	Definition	Sources	Indicators	Codes
System Quality (KS)	Technical quality of the e-commerce platform and measuring its success	Iivari, 2005; ISO 9126	1. System flexibility 2. System Integration 3. Convenience of access 4. Language 5. Reliability	KS1 KS2 KS4 KS5 KS6
Information Quality (KI)	The quality of the content on the e-commerce, as well as the desired output	Iivari, 2005	1. Completeness 2. Suitability 3. Output format	KI1 KI2 KI3

Variables	Definition	Sources	Indicators	Codes
Service Quality (KL)	The quality of the overall support provided by the e-commerce	DeLone and McLean, 2003	1. Visually appealing display 2. Easy transaction services for consumers 3. Keeping promises to provide products or other services that are appropriate 4. Keeping an accurate history of consumer transaction records 5. Provide prompt service 6. Keep consumers updated on product status 7. Provide various payment alternatives along with authentic proof of payment 8. Provide a complaint mechanism for consumers by providing a variety of channels, such as chat, audio, video, or a combination of the three 9. Provide product recommendations with consumer preferences 10. Language that consumers understand 11. Order tracking is available until delivery 12. Features shipping options along with shipping costs are fully legible and easy for consumers to choose from 13. Item delivery flow, delivery duration, and receipt number are conveyed in inaccessible/understandable language details 14. Ease of consumer communication with businesses through communication options such as chat, audio, and video	KL1 KL2 KL3 KL4 KL5
Government Regulation (RP)	Regulations issued by the government that protect consumers when transacting in e-commerce	Cho, 2004; Miyazaki and Fernandez, 2001; Pires, Stanton, and Eckford, 2004; Ueltschy, Krampf, and Yannopoulos 2004; J. W. Wu, 2007	1. Regulations guarantee security in transactions 2. Regulations create a safe/convenient e-commerce system	RP1 RP2
System Usage (P)	E-commerce usage	DeLone and McLean, 2003; Young and Benamati, 2000	1. Frequency of use 2. Duration of use	P1 P2

Structural Equation Modeling (SEM) was employed to achieve the research objective of examining the factors that affect usage. PLS-SEM tests the predictive relationships between constructs by examining their relationships and influence.

2. Results and discussions

2.1. Overall model fit

An overall model fit must be performed to assess whether the proposed model is appropriate for displaying research findings. In contrast to other multivariate analyses, Structural Equation Modeling (SEM) lacks a singular statistical test that effectively demonstrates the predictive capability of a model; thus, it is essential to integrate model fit measures to ascertain the adequacy of a model (Yamin and Kurniawan, 2009). In this study, the measurements used to indicate goodness of fit were the RMR, RMSEA, GFI, AGFI, CFI, IFI, NFI, and RFI (Table 3). The Goodness of Fit (GOF) results consisted of seven measurements. The results showed that almost all measurements met the target fit or cutoff value level; therefore, it can be said that the model is a good fit and suitable for use.

Table 3. Goodness-of-fit (GOF) research model

Goodness of Fit	Cut off value	Analysis Result	
		Value	Desc
RMSR	≤ 0.05	0.019	Good Fit
RMSEA	≤ 0.08	0.069	Good Fit
GFI	≥ 0.90	0.88	Marginal Fit
CFI	≥ 0.90	0.99	Good Fit
IFI	≥ 0.90	0.99	Good Fit
NFI	≥ 0.90	0.98	Good Fit

Next, the CFA output results in loading factors and error variance can be used to calculate the Construct Reliability (CR) and Variance Extracted (VE). The computations were conducted to assess the dependability of the model. The reliability of the construct was determined by calculating the overall loading factor and dividing it by the total squared loading factor and error variance. The extracted variance was computed by dividing the overall loading factor by the total squared loading factor and error variance. Beckett et al. (2018) indicated that the anticipated construct reliability value is CR ≥ 0.7. Nonetheless, a CR value ranging from 0.60 to 0.70 is still deemed acceptable, as long as the validity of the indicator presents encouraging outcomes. The latent variable is deemed reliable if the Variance Extracted (VE) value is greater than or equal to 0.5. Overall, the Construct Reliability (CR) value for each variable was greater than 0.7, indicating reliability. The Variance Extracted (VE) values for every variable were greater than 0.5. As a result, the model used in this research was found to be sufficient (Table 4).

Table 4. Construct reliability (CR) and extracted variance (VE)

Variables	Variance Extracted (VE) Cut-off ≥ 0.5	Construct Reliability (CR) Cut-off ≥ 0.7
System Quality	0.58	0.86
Information Quality	0.70	0.87
Service Quality	0.63	0.95
Government Regulation	0.72	0.84
System Usage	0.55	0.71

2.2. Hypothesis testing

According to the empirical model suggested in this study, Hypothesis testing was performed by assessing the path coefficient and t-value of the structural equation model. If the path coefficient was greater than 0.05 and the t-value exceeded 1.96, the effect of the variables was deemed significant. Nevertheless, if the path coefficient value dropped below 0.05, accompanied by a t-value under 1.96, it was considered insignificant.

The results of the SEM hypothesis show that system quality, information quality, and government regulations significantly and positively affect system usage (Table 5). The R-squared value indicates the importance of the influential variables. System quality, service quality, information quality, and government regulations contribute to as much as 43% of the differences in system usage, whereas the remaining 57% is affected by factors that remain unexamined. The structural equation was $P = 0.50 \times KS + 0.36 \times KI - 0.47 \times KL + 0.32 \times RP$.

Table 5. Hypothesis test results based on structural equation model

Hypothesis	Path	Coeff Beta	t-value	R-squared
H1 – supported	Quality System→ System Usage	0.50	2.20*	0.43
H2 – supported	Quality Information→ System Usage	0.36	2.01*	
H3 – supported	Quality Service→ System Usage	- 0.47	-2.37*	
H4 – supported	Government Regulation→ System Usage	0.32	4.23*	

Significant at a t-value>1.96.

2.2.1. Result: The effect of system quality on usage

Hypothesis 1 posits that system quality has a positive relationship with system usage. A Coeff Beta value of 0.50 signifies a moderate correlation, suggesting that improved system quality leads to increased system usage. A t-value greater than 2.20 suggests that the findings are statistically significant. Prior research has shown that the quality of the system is the key factor influencing satisfaction with applications (Trivedi and Trivedi, 2018). Hassan and Shahzad (2022) indicated that social commerce demonstrates better performance among online sellers via social media platforms.

2.2.2. Result: The effect of information quality on usage

Hypothesis 2 indicates that the quality of information has a positive effect on system usage, although this impact is not as pronounced as that of system quality. The Beta Coefficient value of 0.36 signifies a positive correlation, though its strength is less than that of Hypothesis 1. A t-value of 2.01 indicates that this result is statistically significant as well. This outcome corresponds with the results of several prior studies. Prastiwi and Iswari (2019) propose that the quality of information positively and significantly influences impulse buying in m-commerce apps (such as GoFood). Additionally, research by Hidayat and Anasis (2020) demonstrated that e-service quality directly influences customer satisfaction, an essential factor in fostering loyalty in e-commerce. These findings align with the study by Tajvidi et al. (2021), which indicates that support in user interaction is crucial for social commerce success and highlights the significance of information quality in enhancing user engagement.

2.2.3. Result: The effect of service quality on usage

Hypothesis 3 proposes that a connection exists between service quality and system usage. A negative Coeff Beta value (-0.47) suggests that reduced service quality corresponds to increased system utilization (inverse relationship). A t-value that is negative and exceeds -2.00 implies that this correlation is also statistically significant. The results of this research differ from those of earlier studies. Ramdani claims that excellent service can create a lasting connection between customers and e-commerce providers, which is crucial for fostering customer loyalty (Ramdani, 2023). Sholikhah and Hadita (2022) similarly stated that superior services positively influence customer satisfaction, a crucial factor in fostering loyalty.

2.2.4. Result: The effect of government regulations on usage

Hypothesis 4 examined the impact of government regulations on system usage. The Coeff Beta value of 0.32 indicates a positive relationship, which means that the better the government regulation, the more the system usage increases. A very large t-value (4.23) indicates that this relationship has a very high statistical significance. Other research shows that government support affects the level of e-commerce in the manufacturing SME sector in Ghana (Ocloo et al., 2018). Government regulations have a significant positive impact on system utilization. If government regulations regarding e-commerce are improved, consumer behavior toward utilizing e-commerce will also increase. Government regulations that ensure security in transactions and create a secure e-commerce system will impact the way consumers utilize e-commerce platforms.

3. Discussions

This research employs the DeLone and McLean Information Systems success framework to examine and identify the factors that impact the utilization of e-commerce systems. The findings show that system quality, information quality, and government regulations significantly and positively impact the usage of e-commerce systems. Moreover, this research revealed that service quality significantly negatively impacts e-commerce usage, which contradicts the common belief that improved service quality boosts system usage. This outcome signifies a phenomenon that requires further analysis.

Based on these results, one possible explanation is that consumers have very high expectations for service quality. When the service improves and reaches the desired standard or exceeds expectations, it may result in a decrease in the frequency of system usage. According to Lemon and Verhoef (2016), customers' positive experiences can increase their expectations of future interactions. While we would normally expect that an increase in service quality would increase system usage, in this situation, an increase in service quality could lead to a reduction in system usage. This can happen when service improvements decrease the need for consumers to continue using the platform. If an e-commerce system is designed to be more efficient and make it easier for customers to fulfill their needs more quickly, they may no longer need to visit or interact with the platform frequently. Under these conditions, improvements in service quality may make customers happier with their transactions, but not encourage them to return or continue using the system. Oliver (1999) also asserts that satisfaction is the result of a positive experience but does not necessarily lead to loyalty or continued use.

This research pertains to DeLone and McLean's Information Systems Success Model, which indicates that the quality of systems and services impacts user satisfaction and the utilization of the system. Nevertheless, our findings oppose this model as they indicate that enhancing service quality may lead to a reduction in system utilization. This indicates that overly idealized services may reduce consumers' desire to interact further with the system, contrary to the original expectations of this model.

The results of this study have several implications for each party involved (consumers, companies, and government). Consumers are advised to be careful when choosing an e-commerce platform and are expected to focus on the quality of the services provided by e-commerce. Consumers can search for platforms that have an easy complaint system, transparent transaction procedures, and reviews from users so that they can provide information regarding the quality of services provided. In addition, both positive and negative reviews provided by consumers regarding their experiences need to be conducted to improve the overall quality of e-commerce services.

Furthermore, e-commerce companies should pay more attention to improving service quality to enhance customer experience, including improving the complaint and feedback systems to address customer issues quickly. In addition, companies need to adopt better systems to give consumers greater confidence in transactions. Improving service quality directly affects customer satisfaction and loyalty, leading to increased platform usage and growth.

Governments can develop stricter policies and regulations to strengthen consumer protection in the e-commerce sector. This includes setting service quality standards, implementing more effective complaint regulations, and requiring e-commerce companies to provide clear information on return procedures, dispute resolution, and the protection of consumers' personal data. In addition, the government can increase the transparency of the sector by conducting audits and certifying e-commerce platforms that meet certain criteria.

Conclusion, limitations and future directions

The research determined that system quality, information quality, and governmental regulations have a positive impact on e-commerce usage. Enhanced system performance, dependability, and available information boost the user experience and increase consumer confidence in e-commerce platforms. Government rules are essential in guaranteeing safe and pleasant e-commerce transactions. Nevertheless, the unforeseen adverse impact of service quality on usage underscores the intricacy of consumer expectations. Customers might hold elevated expectations regarding service quality; when these expectations are not fulfilled, they adversely affect their involvement with the platform. Therefore, improving service quality is crucial, yet it might not be enough to boost e-commerce utilization. This research offers significant understanding of the elements influencing e-commerce behavior and highlights the importance of a comprehensive strategy that tackles both technological and regulatory aspects.

This research has a number of limitations. The sample size utilized may not represent the whole population of e-commerce users; hence, these findings require additional testing with a bigger and more diverse sample. Moreover, this research employed a restricted quantitative method to clarify the explanations for the findings.

Consequently, qualitative research that investigates consumers' narratives can be quite valuable in comprehending thoroughly how service quality influences system usage from the viewpoint of consumers. Upcoming research should also take into account external elements such as governmental regulations, market conditions, and socio-economic shifts that could influence the link between service quality and the use of e-commerce.

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