

ANALYZING E-COMMERCE USER SATISFACTION THROUGH A HYBRID DELONE & MCLEAN AND TAM APPROACH: A STUDY OF SHOPEE AND TOKOPEDIA USERS IN INDONESIA

ANÁLISE DA SATISFAÇÃO DOS USUÁRIOS DE COMÉRCIO ELETRÔNICO ATRAVÉS DE UMA ABORDAGEM HÍBRIDA DE DELONE & MCLEAN E TAM: UM ESTUDO SOBRE OS USUÁRIOS DA SHOPEE E DA TOKOPEDIA NA INDONÉSIA

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Cheng-Wen Lee*

*Department of International Business, College of Business, Chung Yuan Christian University, Taoyuan City, Taiwan

Orcid: <https://orcid.org/0000-0002-4811-7000>
chengwen@cycu.edu.tw

Ping-Hung Chen*

*College of Business, Chung Yuan Christian University, Taoyuan City, Taiwan
vvv8952002@gmail.com

Moch Bisyrri Effendi*

*College of Business, Chung Yuan Christian University, Taoyuan City, Taiwan
bisyrrieffendi@gmail.com

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Abstract

This research investigates user satisfaction within e-commerce in East Java by utilizing a comprehensive framework that integrates the Technology Acceptance Model (TAM) with the DeLone and McLean (D&M) Information Systems Success Model, specifically concentrating on the prominent platforms Shopee and Tokopedia. Through the application of PLS-SEM, the results indicate that both Information Quality (IQ) and System Quality (SyQ) significantly positively influence Perceived Ease of Use (PEU) and Perceived Usefulness (PU), with PEU further augmenting PU. Additionally, it is revealed that PEU, PU, and Service Quality (SvQ) directly and significantly affect user satisfaction, with SvQ being identified as the most critical factor. The structural model demonstrates considerable explanatory power ($R^2 = 0.73$), reflecting a strong capacity to account for variations in user satisfaction. These results highlight the essential influence of SvQ alongside technological characteristics in determining user satisfaction while also confirming the theoretical strength of merging TAM with the D&M model within the realm of e-commerce in developing digital markets.

Keywords: TAM. DeLone & McLean Model. SEM-PLS.

Resumo

Esta pesquisa investiga a satisfação do usuário no comércio eletrônico em Java Oriental, utilizando uma estrutura abrangente que integra o Modelo de Aceitação da Tecnologia (TAM) com o Modelo de Sucesso de Sistemas de Informação de DeLone e McLean (D&M), com foco específico nas plataformas Shopee e Tokopedia. Através da aplicação da modelagem de equações estruturais com mínimos quadrados parciais (PLS-SEM), os resultados indicam que tanto a Qualidade da Informação (QI) quanto a Qualidade do Sistema (QS) influenciam positivamente a Facilidade de Uso Percebida (FUP) e a Utilidade Percebida (UP), sendo que a FUP aumenta ainda mais a UP. Além disso, revela-se que a FUP, a UP e a Qualidade do Serviço (QS) afetam direta e significativamente a satisfação do usuário, com a QS sendo identificada como o fator mais crítico. O modelo estrutural demonstra um poder explicativo considerável ($R^2 = 0,73$), refletindo uma forte capacidade de explicar as variações na satisfação do usuário. Esses resultados destacam a influência essencial da QS, juntamente com as características tecnológicas, na determinação da satisfação do usuário, ao mesmo tempo que confirmam a força teórica da fusão do TAM com o modelo D&M no contexto do comércio eletrônico em mercados digitais em desenvolvimento.



Palavras-chave: TAM. DeLone & McLean Model. SEM-PLS.

1 INTRODUCTION

Rapid digital transformation has significantly fuelled the growth of the e-commerce sector in Indonesia, propelled by increasing internet accessibility and mobile device utilization (Laudon & Traver, 2021; Statista, 2023; Venkatesh *et al.*, 2012). Prominent platforms like Shopee and Tokopedia have emerged as leading digital marketplaces, thanks to their user-friendly interfaces, extensive product selections, and integrated payment solutions (Gefen *et al.*, 2003; Pavlou, 2003; Kim *et al.*, 2008). The effectiveness of these platforms heavily relies on the quality of their information systems to provide dependable services and enhance user experiences (DeLone & McLean, 2003; Wixom & Todd, 2005). Consequently, it is crucial to comprehend the factors that contribute to information system success and technology acceptance to elucidate user satisfaction and ongoing engagement (Petter *et al.*, 2008; Urbach & Müller, 2012).

The Technology Acceptance Model (TAM) posits that Perceived Usefulness (PU) and Perceived Ease of Use (PEU) are fundamental factors influencing technology acceptance (Davis, 1989; Venkatesh *et al.*, 2003). Research has shown that systems regarded as both useful and easy to navigate tend to experience greater acceptance and sustained usage (King & He, 2006; Schepers & Wetzels, 2007). In parallel, the DeLone & McLean (D&M) information System Success (IS) Model highlights that System Quality (SyQ), Information Quality (IQ), and Service Quality (SvQ) are critical elements determining overall system success, which impacts user satisfaction and net benefits derived from usage (DeLone & McLean, 2003; Petter *et al.*, 2008; Urbach *et al.*, 2010).

Within this theoretical framework, IQ is vital in influencing PU. IQ pertains to how accurate, relevant, complete, and timely system output is in assisting users during decision-making processes (DeLone & McLean, 2003). High-quality information diminishes uncertainty while enhancing decision-making accuracy and operational efficiency for users. This improved perception fosters a belief in the system's utility

(Wixom & Todd, 2005; Ahn *et al.*, 2007), thereby indicating that superior IQ leads to an elevated sense of PU within e-commerce environments.

By integrating TAM with the DeLone & McLean model, a holistic framework emerges for interpreting user behaviour in e-commerce settings. This integration links technological system attributes with psychological factors affecting acceptance levels (Wixom & Todd, 2005; Petter *et al.*, 2008; Hsu *et al.*, 2014). It elucidates how dimensions of SyQ affect cognitive assessments such as PU and ease of use—elements that ultimately influence user satisfaction and intentions toward future behaviours (Devaraj *et al.*, 2002; Ahn *et al.*, 2007). In examining users of Shopee and Tokopedia in East Java specifically, the relevance of this framework is amplified by varying levels of digital literacy as well as differences in infrastructure and overall user experience.

East Java stands out as one of Indonesia's largest provinces with a population exceeding forty million residents. Its burgeoning digital economy is bolstered by high internet penetration rates (BPS East Java, 2023; APJII, 2023). While Shopee and Tokopedia enjoy widespread popularity owing to their accessibility features alongside digital payment capabilities (Gefen *et al.*, 2003; Kim *et al.*, 2008), there remain inconsistencies in user satisfaction driven by challenges, including inaccurate product descriptions, delays in delivery services, and responsiveness issues from customer support teams (Parasuraman *et al.*, 2005; Collier & Bienstock, 2006; Blut *et al.*, 2015). Thus, examining aspects such as SyQ alongside IQ and SvQ becomes paramount for grasping user satisfaction within e-commerce contexts.

2 LITERATURE REVIEW

2.1 Hybridization of TAM and DeLone & McLean is success model

The TAM suggests that the acceptance of technology is primarily influenced by two main factors: PU and PEU. These factors shape users' attitudes, intentions to behave, and their actual usage behaviour (Davis, 1989; Venkatesh *et al.*, 2003). In the realm of contemporary information systems, PU and PEU continue to be vital in determining whether users embrace and persist in using digital technologies, such as e-commerce platforms (Dwivedi *et al.*, 2021; Oliveira *et al.*, 2022). This underscores the importance

of users' views on a system's usefulness and ease of use in achieving successful technology adoption.

On the other hand, the D&M IS Success Model asserts that the success of an information system is contingent upon SyQ, IQ, and SvQ. These elements subsequently affect user satisfaction and overall net benefits (DeLone & McLean, 2003; Petter *et al.*, 2008). This model highlights that both technical attributes and output quality are essential for assessing an information system's effectiveness across diverse digital contexts (Wang *et al.*, 2021; Ahn *et al.*, 2021).

By integrating TAM with the DeLone & McLean model, a more thorough hybrid framework emerges. In this framework, SyQ and IQ can influence PU and PEU. Additionally, user satisfaction and net benefits serve to enhance behavioural intentions and ongoing usage. This combined approach provides a comprehensive perspective by merging technological characteristics with users' psychological perceptions in understanding technology acceptance (Hsu *et al.*, 2020; Seddon, 2021). Specifically, within e-commerce platforms like Shopee and Tokopedia operating in East Java, this model is particularly applicable for clarifying differences in user experiences shaped by varying levels of digital literacy and infrastructure conditions.

2.2 Research hypotheses

2.2.1 Information quality (IQ) on perceived usefulness (PU)

IQ is a key component of the D&M IS Success Model, focusing on the quality of outputs in terms of accuracy, relevance, completeness, and timeliness. In e-commerce, IQ pertains to a platform's capacity to deliver product information that is clear, dependable, and easily comprehensible for users. According to the TAM, PU refers to the extent to which users believe that utilizing a system will improve their performance. The provision of high-quality information is essential in facilitating users' decision-making processes and enhancing their perception of the system's utility. Numerous empirical studies have consistently shown that IQ has a significant impact on PU. For example, research conducted by Alalwan *et al.* (2018), Shareef *et al.* (2019), and Hsu *et al.* (2020) indicates

that accurate, relevant, and trustworthy information increases users' PU of digital platforms, especially within the realm of e-commerce.

H1: IQ has a positive effect on PU

2.2.2 System quality (SyQ) on perceived usefulness (PU)

SyQ encompasses the technical capabilities of a system, which include factors such as access speed, reliability, adaptability, and user-friendly navigation. In the context of e-commerce, elevated SyQ significantly increases user efficiency when engaging with the platform. According to the TAM, high SyQ positively affects PU, as a swift and dependable system allows users to complete tasks more efficiently. This correlation is supported by empirical research from Tam and Oliveira (2017), further substantiated by Wixom and Todd (2005) and Petter *et al.* (2008), who emphasize that SyQ is essential in influencing users' perceived advantages.

H2: SyQ has a positive effect on PU

2.2.3 Information quality (IQ) on perceived ease of use (PEU)

PEU is defined as the extent to which users feel that operating a system is straightforward. Effectively presented information aids users in comprehending and navigating a platform with greater ease. The D&M model posits that high-quality information diminishes the difficulties linked to using a system. This viewpoint is echoed by Wixom and Todd (2005), who assert that the quality of information enhances PEU by improving clarity and user understanding. Additionally, recent research conducted by Gupta and Dogra (2023) validates that IQ significantly positively impacts PEU, especially within digital and e-commerce environments.

H3: IQ has a positive effect on PEU

2.2.4 System quality (SyQ) on perceived ease of use (PEU)

SyQ is fundamentally linked to the user-friendliness of a system. Systems that feature well-crafted interfaces, intuitive navigation, and quick response times typically

improve users' perceptions regarding their ease of use. According to the TAM, the PEU is mainly shaped by characteristics related to the system itself. Venkatesh *et al.* (2016) emphasize that SyQ is a crucial factor influencing PEU. This connection is further corroborated by recent empirical research, including findings by Al-Fraihat *et al.* (2020), which reveal that SyQ significantly enhances PEU across a range of digital platforms.

H4: SyQ has a positive effect on PEU

2.2.5 Perceived ease of use (PEU) on perceived usefulness (PU)

Within the TAM, the connection between PEU and PU is deemed essential. When a system is user-friendly, it enhances users' views on its usefulness by facilitating more efficient and effective task execution. Davis (1989) indicates that reduced effort required from users leads to improved system effectiveness, which in turn boosts PU. This correlation has been consistently validated by recent empirical research, including studies by Abdullah *et al.* (2021) and Chao (2019), which reveal that PEU significantly positively influences PU in relation to digital technologies and e-commerce platforms.

H5: PEU has a positive effect on PU

2.2.6 Information quality (IQ) on user satisfaction

User satisfaction serves as a vital measure of system effectiveness in the D&M IS Success Model, representing users' comprehensive assessment of their interaction with a system. High IQ defined by attributes such as accuracy, relevance, completeness, and timeliness—bolsters user trust and confidence, subsequently resulting in increased satisfaction levels. In e-commerce settings, providing clear, dependable, and well-organized information minimizes uncertainty and aids users in making well-informed decisions. Research conducted by Kim *et al.* (2018) and Oliveira *et al.* (2020) demonstrates that IQ significantly enhances user satisfaction, highlighting its essential contribution to enriching user experiences and ensuring the success of digital platforms.

H6: IQ has a positive effect on user satisfaction

2.2.7 Perceived usefulness (PU) on user satisfaction

PU indicates the degree to which users believe that utilizing a system yields significant advantages and improves their performance. A heightened sense of PU correlates with increased user satisfaction, as individuals tend to appreciate and find value in systems that adequately meet their needs and assist them in their tasks. This connection is reinforced by Bhattacharjee (2001) through the Expectation Confirmation Model (ECM), which suggests that PU plays a pivotal role in determining satisfaction after adoption. Additionally, recent research, including a study by Ashraf *et al.* (2022), substantiates that PU has a notable positive impact on user satisfaction, emphasizing its essential influence on fostering positive user experiences within digital platforms.

H7: PU has a positive effect on user satisfaction

2.2.8 Perceived ease of use (PEU) on user satisfaction

PEU plays a crucial role in influencing user satisfaction, as systems that are user-friendly decrease the effort required by users, alleviate frustration, and improve the overall experience. When individuals view a system as straightforward and easy to navigate, they tend to feel more at ease and satisfied with its utilization. This connection is corroborated by Alalwan (2020), who demonstrated that PEU has a notable positive impact on user satisfaction, especially within digital and e-commerce environments. This suggests that the simplicity of interaction is a significant factor in achieving positive user assessments.

H8: PEU has a positive effect on user satisfaction

2.2.9 System quality (SvQ) on user satisfaction

SyQ plays a vital role in influencing user satisfaction, as it indicates the overall performance of a system regarding its stability, reliability, responsiveness, and speed. A system that functions seamlessly and swiftly enhances the user experience by facilitating effective interaction and minimizing potential interruptions during usage. Such a favourable experience ultimately contributes to increased user satisfaction levels.

Research supports this connection; studies by Petter *et al.* (2008) and Al-Fraihat *et al.* (2020) illustrate that SyQ significantly positively impacts user satisfaction, underscoring its crucial importance in promoting successful system adoption and maintaining user engagement in digital contexts.

H9: SyQ has a positive effect on user satisfaction

2.2.10 System quality (SvQ) on user satisfaction

Service quality is a non-technical aspect that indicates the level of services offered by a platform, encompassing elements such as responsiveness, empathy, and the reliability of support services. In the IS Success Model proposed by DeLone & McLean (2003), SvQ is recognized as a crucial factor influencing user satisfaction, highlighting the significance of how effectively a system aids its users beyond mere technical capabilities. A high standard of SvQ fosters users' trust and comfort when engaging with the platform, which in turn enhances their overall satisfaction. Research conducted by Blut *et al.* (2015) and Rita *et al.* (2019) further substantiates that SvQ has a notable positive impact on user satisfaction within the e-commerce sector, frequently acting as one of the primary determinants in cultivating favourable user experiences.

H10: SvQ has a positive effect on user satisfaction

2.2.11 Perceived ease of use (PEU) mediates the influence of information quality (IQ) on perceived usefulness (PU)

Within the combined framework of the TAM and the D&M IS Success Model, this relationship demonstrates that IQ sequentially affects users' cognitive perceptions. When information is of high quality, it improves users' comprehension and interaction with the system, which in turn influences their views on ease of use and usefulness. In this scenario, PEU serves as a mediating factor that connects the impact of both SyQ and IQ to PU. Empirical research conducted by Wixom and Todd (2005) and Hsu *et al.* (2014) substantiates this connection, illustrating that PEU plays a significant mediating role between system/IQ and PU. These results underscore the significance of cognitive

processing pathways in elucidating how characteristics of systems and information ultimately affect user acceptance and perceived value of the system.

H11: PEU mediates the influence of IQ on PU.

2.2.12 Perceived ease of use (PEU) mediates the influence of information quality (IQ) on perceived usefulness (PU)

High-quality information plays a crucial role in enhancing user satisfaction, both directly and indirectly, by influencing PEU. When information is clear, precise, and easily comprehensible, it minimizes the cognitive load on users while interacting with the system, leading to a more effective and favourable user experience. Theoretically, this suggests that the quality of information improves users' assessments of the system and promotes smoother interactions, ultimately boosting overall satisfaction. Empirical research supports this notion; Gupta and Dogra (2023) reveal that PEU acts as a significant mediating factor connecting IQ to user satisfaction. These results highlight that the positive effects of IQ on satisfaction are amplified when users find the system easy to navigate and understand, emphasizing the critical role of usability in fostering beneficial outcomes for users in digital contexts.

H12: PEU mediates the influence of IQ on user satisfaction.

2.2.13 Perceived ease of use (PEU) mediates the influence of information quality (IQ) on user satisfaction

In addition to its role in PEU, the quality of information can also improve user satisfaction through its PU. When a system offers information that aids users in making more accurate and effective decisions, their view of the system's usefulness rises, leading to increased satisfaction. Nonetheless, research indicates that this indirect influence is not always robust or consistent. Bhattacharjee (2001), utilizing the Expectation Confirmation Model, along with further studies by Hsu *et al.* (2014), propose that the mediating effect of PU may at times be less significant than the direct effect of IQ on user satisfaction. These results suggest that while PU is an important factor in explaining user experience,

the direct effect of IQ on satisfaction often has a greater impact on users' overall assessment of a system.

H13: PEU mediates the influence of IQ on User Satisfaction

2.2.14 Perceived ease of use (PEU) mediates the influence of system quality (SvQ) on perceived usefulness (PU)

A well-constructed SyQ greatly enhances usability, which subsequently boosts its PU. A platform that is quick, reliable, and easy to navigate allows users to engage with it more effectively and comfortably, thereby elevating their assessment of its practical advantages. Theoretically, this suggests that SyQ affects user acceptance both directly and indirectly through users' cognitive assessments of ease and usefulness. Venkatesh *et al.* (2003) and Al-Fraihat *et al.* (2020) provide empirical evidence supporting this connection, indicating that PEU acts as a significant mediating factor between SyQ and PU. These results highlight the importance of a system's technical performance in influencing user perceptions, especially when it facilitates smooth interactions that ultimately enhance PU.

H14: PEU mediates the influence of SyQ on PU.

2.2.15 Perceived ease of use (PEU) mediates the influence of system quality (SvQ) on user satisfaction

SyQ influences user satisfaction directly and indirectly via PEU. A system that boasts high performance, intuitive navigation, and a user-friendly design enhances the interaction experience for users. This improvement in interaction contributes to a greater PEU, which in turn fosters higher levels of satisfaction. Theoretically, this suggests that user satisfaction is influenced not only by the system's technical features but also by users' assessments of its usability. Empirical research supports this notion, with DeLone & McLean (2003) illustrating that PEU serves as a crucial mediating factor connecting SyQ to user satisfaction. These insights underscore the significance of usability as an essential pathway through which SyQ leads to favorable user experiences.

H15: PEU mediates the influence of SyQ on User Satisfaction

2.2.16 Perceived usefulness (PU) mediates the influence of system quality (SvQ) on user satisfaction

SyQ can impact user satisfaction by influencing PU. When a system exhibits high performance in areas like speed, reliability, and functionality, users are more inclined to view it as beneficial for completing their tasks and meeting their needs. This perception of usefulness leads to increased satisfaction, as users assess the system based on the advantages it offers. Theoretically, this implies that SyQ affects user satisfaction both directly and indirectly through evaluations of its usefulness. Research conducted by Devaraj *et al.* (2002) and later studies suggests that PU may serve as a mediating variable in the connection between SyQ and user satisfaction; however, its mediating influence is often considered less significant than other factors such as PEU.

H16: PU mediates the influence of SyQ on User Satisfaction

2.2.17 Perceived usefulness (PU) mediates the influence of perceived ease of use (PEU) on user satisfaction

Within the TAM, the perception of ease of use directly impacts user satisfaction and also indirectly affects it through PU. When a system is user-friendly, it improves users' belief in its benefits and efficiency for their tasks, subsequently resulting in increased satisfaction levels. Theoretically, this suggests that ease of use is fundamental in shaping users' cognitive assessments regarding the usefulness of a system, which ultimately influences their overall satisfaction. Empirical evidence supporting this connection is found in the works of Venkatesh and Davis (2000) as well as Chao (2019), who illustrate that PEU has a significant effect on satisfaction via the mediating influence of PU across different contexts of technology adoption.

H17: PU mediates the influence of PEU on User Satisfaction.

3 RESEARCH DESIGN

This research adopts a quantitative methodology, utilizing a survey technique to investigate the elements impacting user satisfaction among Tokopedia and Shopee users in East Java. Primary data were gathered through online questionnaires disseminated via social media and messaging apps. Participants were chosen through purposive sampling, meeting specific criteria: they must be at least 17 years old, reside in East Java, and have made a minimum of two transactions on either Shopee or Tokopedia within the previous three months, aiming for 300 valid responses. The research was carried out in August 2025. The focus on East Java is due to its substantial population, extensive internet access, and varied socio-demographic features that span urban and rural areas, making it an ideal setting for analyzing e-commerce user behaviours.

Data collection utilized a 5-point Likert scale, which was piloted to confirm the instrument's validity and clarity. Data analysis employed PLS-SEM with WarpPLS 7.0, a widely recognized method in information systems and e-commerce studies for exploring intricate relationships among latent variables (Hair *et al.*, 2019; Sarstedt *et al.*, 2021). The measurement model underwent evaluation through convergent validity (AVE ≥ 0.5), reliability checks (including Cronbach's Alpha, Composite Reliability, and $\rho_A > 0.7$), as well as discriminant validity assessments using the Fornell-Larcker Criterion and HTMT (< 0.90). These procedures are standard in SEM-based research to affirm construct validity and reliability (Henseler *et al.*, 2015; Hair *et al.*, 2019). The structural model's evaluation included path coefficients, R^2 values, and predictive relevance (Q^2), while mediation analysis utilized the Variance Accounted For (VAF) method to investigate the mediating roles of PEU and PU.

The study examines seven latent variables: IQ, SyQ, SvQ (SvQ), PEU, PU, and user satisfaction (S). IQ, SyQ, and SvQ serve as independent variables; PEU and PU function as mediators; user satisfaction is treated as the dependent variable. All constructs are based on the Technology Acceptance Model (Davis, 1989) and the D&M IS Success Model (DeLone & McLean, 2003), both of which have received extensive validation in earlier research endeavours. This framework aims to elucidate how various SyQ factors influence users' psychological perceptions that ultimately determine their satisfaction with e-commerce platforms.

4 RESULT AND DISCUSSION

4.1 Respondent characteristics

To offer a more detailed insight into the characteristics of respondents concerning their preferences for e-commerce platforms, gender, and geographical distribution, the following table presents descriptive data. This table is designed to enhance comprehension of the distribution of Shopee and Tokopedia users within the Surabaya area, which is the primary focus of this research.

Table 1
Respondent Characteristics

Platform		City							Total	
		Surabaya	Sidoarjo	Gresik	Mojokerto	Lamongan	Bangkalan	Other		
Shopee	Gender	Male	6	9	11	9	9	11	8	63
		Female	13	11	16	15	11	12	13	91
	Total	19	20	27	24	20	23	21	154	
Tokopedia	Gender	Male	10	5	4	6	12	6	12	55
		Female	19	10	23	13	17	14	17	113
	Total	29	15	27	19	29	20	29	168	
Total	Gender	Male	16	14	15	15	21	17	20	118
		Female	32	21	39	28	28	26	30	204
	Total	48	35	54	43	49	43	50	322	

The findings reveal distinct preferences for e-commerce platforms, specifically between Shopee and Tokopedia, influenced by gender and city demographics in the Surabaya area. Tokopedia shows a slight edge with a total user count of 168 compared to Shopee's 154. Notably, female users dominate both platforms, totalling 204 compared to 118 male users, suggesting that women engage more actively in online shopping than men. Geographically, Shopee's user base is primarily located in Gresik, Mojokerto, and Bangkalan, while Tokopedia exhibits a more extensive distribution across Surabaya and Gresik alongside other regions, indicating its broader market reach. In summary, Gresik emerges as the area with the highest number of users overall, followed by Surabaya and other locations. This suggests that suburban regions play a significant role in e-commerce participation alongside larger urban canterers. Ultimately, these results highlight a stronger presence of female users on both platforms and indicate that Tokopedia has a more evenly

spread geographical user base compared to Shopee, which could inform future marketing approaches and targeting strategies for each platform.

Figure 1

Tokopedia

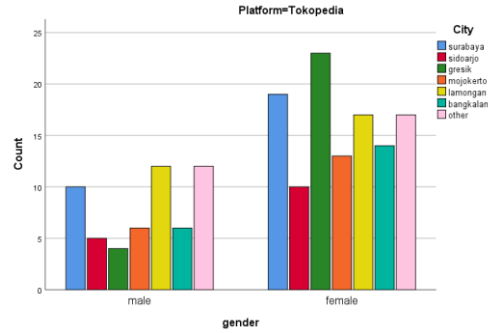
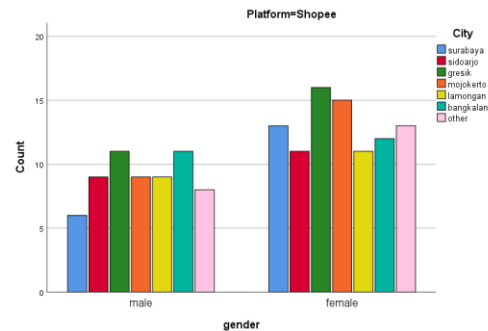


Figure 2

Shopee



The bar chart reveals that both Tokopedia and Shopee are primarily utilized by female users across various cities, with women consistently exhibiting greater engagement than men in all regions. Tokopedia shows the highest female user engagement in Gresik, followed by Surabaya, Lamongan, and other locations, while male participation remains relatively low throughout the cities. In a similar vein, Shopee displays significant female dominance, especially in Gresik, Mojokerto, and Bangkalan; however, male involvement is lower and more evenly spread but still trails behind female usage. Regionally, both platforms show considerable user distribution extending beyond the central urban area of Surabaya, with suburban locales such as Gresik, Mojokerto, and

Lamongan making notable contributions to overall platform usage. These observations underscore a persistent trend of gender imbalance favouring female users and suggest that both platforms have established a strong presence in suburban areas, indicating opportunities for more focused marketing strategies that consider gender and geographic location.

4.2 Measurement model evaluation

4.2.1 Model fit and quality indices

The evaluation of the proposed research model's fit and structural quality was conducted through WarpPLS, which provided goodness-of-fit measures and quality indices to determine the model's explanatory capabilities, predictive relevance, and any potential multicollinearity concerns among the constructs. Below are the results of the primary indicators for model fit:

Table 2

Goodness-of-Fit Model

Measure	Value	Regulated
Average path coefficient (APC)	0.232	P<0.001
Average R-squared (ARS)	0.458	P<0.001
Average adjusted R-squared (AARS)	0.457	P<0.001
Average block VIF (AVIF)	2.307	acceptable if ≤ 5 , ideally ≤ 3.3
Average full collinearity VIF (AFVIF)	2.012	acceptable if ≤ 5 , ideally ≤ 3.3
Tenenhaus GoF (GoF)	0.536	small ≥ 0.1 , medium ≥ 0.25 , large ≥ 0.36
Sympson's paradox ratio (SPR)	1.000	acceptable if ≥ 0.7 , ideally = 1
R-squared contribution ratio (RSCR)	1.000	acceptable if ≥ 0.9 , ideally = 1
Statistical suppression ratio (SSR)	1.000	acceptable if ≥ 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)=	1.000	acceptable if ≥ 0.7

The findings from the Goodness of Fit analysis indicate that the structural model is both robust and statistically sound. The values for APC, ARS, and AARS are significant ($P < 0.001$), demonstrating meaningful correlations and substantial predictive capability, with an explanation of 45.8% of the variance. Concerns regarding multicollinearity are alleviated, as both AVIF and AFVIF fall within acceptable thresholds. A GoF value of

0.536 signifies a strong overall fit for the model, while all supplementary indices (SPR, RSCR, SSR, NLBCDR) achieve optimal values, indicating no statistical complications. In summary, the model exhibits excellent explanatory power and a favourable fit.

4.2.2 Outer model analyses

The evaluation results of the measurement model are summarized in the table below, offering insight into the suitability of both indicators and constructs. This section emphasizes the analysis of the outer model, which encompasses convergent validity, reliability, and discriminant validity.

Table 3

Outer Loading

Indicator	Loading Factor						AVE	CA	CR	VIF
	IQ	SyQ	PU	PEU	S	SvQ				
IQ1	0.754	0.018	-0.092	0.088	0.022	-0.038	0.616	0.79	0.865	1.337
IQ2	0.806	-0.018	-0.011	-0.067	0.077	-0.068				
IQ3	0.855	-0.06	0.003	0.051	-0.023	0.069				
IQ4	0.717	0.073	0.109	-0.078	-0.086	0.034				
SyQ1	0.003	0.853	0.082	-0.044	0.097	-0.192	0.680	0.764	0.864	2.331
SyQ2	0.009	0.846	-0.073	-0.019	0.212	-0.178				
SyQ4	-0.013	0.773	-0.011	0.072	-0.339	0.407				
PU1	0.054	-0.134	0.737	0.025	0.102	0.061				
PU2	-0.028	-0.066	0.827	0.043	0.054	0.034	0.559	0.735	0.835	1.749
PU3	0.024	0.138	0.737	-0.226	-0.107	-0.122				
PU4	0.008	0.076	0.682	0.164	-0.063	0.031				
1	-0.035	0.061	0.212	0.772	-0.116	0.108				
3	-0.003	0.004	-0.125	0.851	-0.004	-0.025	0.67	0.753	0.859	1.621
4	0.035	-0.062	-0.073	0.831	0.112	-0.075				
S1	-0.072	0.079	-0.082	0.008	0.747	0.055				
S2	-0.022	-0.246	-0.038	0.012	0.817	0.278				
S3	0.062	-0.119	0.146	-0.042	0.801	-0.148	0.629	0.803	0.871	2.56
S4	0.025	0.291	-0.032	0.022	0.811	-0.182				
SvQ1	-0.001	0.148	-0.029	-0.022	0.002	0.827				
SvQ2	-0.028	-0.078	-0.067	0.029	0.105	0.824				
SvQ3	0.088	-0.482	0.224	-0.098	0.166	0.756	0.611	0.786	0.862	2.472
SvQ4	-0.048	0.362	-0.097	0.082	-0.265	0.770				

Note: Average Variance Extracted (AVE); Cronbach's Alpha (CA); Composite Reliability (CR); Variance Inflation Factor (VIF); Information Quality (IQ); System Quality (SyQ); perceived usefulness (PU); perceived ease of use (PEU); Satisfaction (S); Service Quality (SvQ)

Overall, the findings suggest that every measurement construct utilized in this research is both valid and reliable. All indicators fulfil the necessary outer loading

standards, with AVE values surpassing the minimum requirements, thereby confirming sufficient convergent validity. Furthermore, the Composite Reliability (CR) and Cronbach's Alpha values reflect strong internal consistency across all constructs. The Variance Inflation Factor (VIF) values are also within acceptable ranges, signifying that there are no multicollinearity concerns among the indicators. Consequently, it can be inferred that the measurement model meets the essential criteria for validity and reliability, making it suitable for further analysis of the structural model.

Table 4

HTMT ratios

	IQ	SyQ	PU	PEU	S	SvQ
IQ						
SyQ	0.517					
PU	0.519	0.573				
PEU	0.336	0.527	0.788			
S	0.537	0.891	0.556	0.471		
SvQ	0.508	0.879	0.559	0.558	0.869	

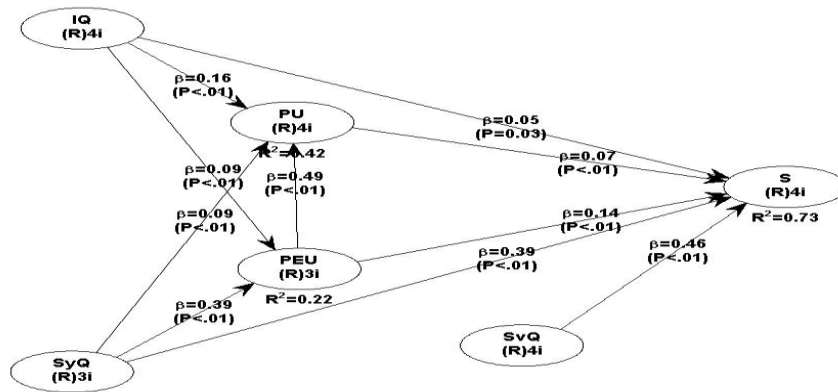
Note: Information Quality (IQ); System Quality (SyQ); perceived usefulness (PU); perceived ease of use (PEU); Satisfaction (S); Service Quality (SvQ)

Overall, the HTMT findings show that all correlations between constructs remain beneath the suggested limit. Consequently, it can be inferred that discriminant validity within the measurement model has been sufficiently confirmed.

4.2.3 Inner model analysis

The analysis of the structural model (inner model) aims to investigate the connections between latent constructs within the research framework. This evaluation emphasizes path coefficients, the coefficient of determination (R^2), and overall model fit to determine how effectively the model elucidates the proposed relationships among variables. The findings from this analysis are organized and displayed through a structural model diagram and accompanying tables as outlined below:

Figure 3
Structural Modelling



Note: Information Quality (IQ); System Quality (SyQ); perceived usefulness (PU); perceived ease of use (PEU); Satisfaction (S); Service Quality (SvQ)

Table 5
Hypothesis Testing

Variable	Coefficient	Direct Effect	Indirect Effect	Total Effect	VAF	Mediating Test
H1 : IQ --> PU	0.156 ***					
H2: SyQ --> PU	0.088 ***					
H3: IQ --> PEU	0.091 ***					
H4: SyQ --> PEU	0.395 ***					
H5: PEU --> PU	0.485 ***					
H6: IQ - S	0.047 **					
H7: PU --> S	0.07 ***					
H8: PEU--> S	0.144 ***					
H9: SyQ --> S	0.387 ***					
H10: SvQ --> S	0.457 ***					
H11: IQ --> PEU --> PU		0.156	0.044	0.2	0.22	Mediating
H12: IQ --> PEU --> S		0.047	0.013	0.06	0.22	Mediating
H13: IQ --> PU --> S		0.047	0.011	0.058	0.19	Not Mediating
H14: SyQ --> PEU--> PU		0.088	0.192	0.28	0.69	Mediating
H15: SyQ --> PEU --> S		0.387	0.057	0.444	0.13	Not Mediating
H16: SyQ --> PU --> S		0.387	0.006	0.393	0.02	Not Mediating
H17: PEU--> PU-->S		0.144	0.034	0.178	0.19	Not Mediating

Note: Information Quality (IQ); System Quality (SyQ); perceived usefulness (PU); perceived ease of use (PEU); Satisfaction (S); Service Quality (SvQ); VAF = Variance Account For
*** significant <0.01; **significant <0.05

Based on the outcomes of the hypothesis testing, all proposed direct relationship hypotheses (H1–H10) have received support, demonstrating that each construct has a

positive and statistically significant impact. These results indicate that IQ, SyQ, SvQ, PEU, and PU play crucial roles in influencing user satisfaction on the e-commerce platform. In contrast, the mediation analysis reveals that only some hypotheses are supported, specifically H11, H12, and H14, while H13, H15, H16, and H17 are not empirically supported. This indicates that the mediating role within the proposed model is partial and limited, whereby PEU functions as a mediator only in specific relationships, particularly in enhancing PU, but does not consistently mediate the relationship between the antecedent variables and user satisfaction. Therefore, it can be concluded that user satisfaction is more strongly and directly influenced by SyQ and SvQ, rather than being predominantly explained through indirect mediating mechanisms.

The results of this research provide significant theoretical advancements by thoroughly enhancing the combination of the TAM and the D&M Information Systems Success Model in relation to e-commerce. Firstly, the prominence of SvQ in affecting User Satisfaction (H10) not only supports the framework proposed by DeLone and McLean (2003) but also repositions its relative importance compared to system and IQ dimensions. While the original model conceptualizes these three quality dimensions as co-determinants, the present findings suggest a hierarchical shift in which service-related attributes—such as responsiveness, reliability, and support become the primary drivers of satisfaction. This indicates that, in digitally mediated environments, value creation is increasingly embedded in service interactions rather than in the technical excellence of the system alone, thereby aligning with a service-dominant logic perspective and extending prior e-SvQ literature (Blut *et al.*, 2015; Rita *et al.*, 2019).

Second, the significant relationship between SyQ and PEU (H4), as well as the subsequent effect of PEU on PU (H5), reaffirms the fundamental causal structure of TAM (Davis, 1989). More importantly, these findings empirically validate the integrative framework proposed by Wixom and Todd (2005), in which system characteristics derived from the D&M model function as antecedents to user belief constructs in TAM. In this regard, SyQ operates as a critical external variable that shapes cognitive evaluations of technology. However, the relatively weak direct effect of PU on User Satisfaction (H7) signals a theoretical boundary condition of TAM, suggesting that its explanatory power may diminish in post-adoption contexts. This implies that users in mature e-commerce ecosystems no longer rely predominantly on utilitarian evaluations but increasingly

emphasize experiential and service-related factors, thereby challenging the centrality of PU in predicting satisfaction outcomes.

Furthermore, the mediation analysis provides a more nuanced theoretical refinement by demonstrating that PEU serves as a more robust mediating mechanism than PU. The support for H11, H12, and H14 highlights the pivotal role of ease of use as a cognitive enabler that translates system and IQ into perceived value and satisfaction, consistent with both TAM and the integrative perspective of Wixom and Todd (2005). Conversely, the absence of significant mediation effects involving PU (H13, H16, H17) suggests that its role as an intervening construct is contingent upon the stage of technology usage. This finding challenges the conventional assumption within TAM that positions PU as a dominant mediator and instead supports the post-adoption perspective of Bhattacharjee (2001), where continued usage behaviour is driven more by experiential confirmation and satisfaction than by initial utility perceptions.

Collectively, these findings advance the literature by proposing a reconceptualization of technology acceptance and information systems success in e-commerce settings. Specifically, they indicate a shift from a cognition-centric model toward a more service- and experience-oriented framework, in which direct effects, particularly those associated with service and system performance, outweigh indirect cognitive pathways. This underscores the necessity of extending traditional TAM and D&M models to incorporate service-dominant and experiential constructs, thereby providing a more comprehensive explanation of user behaviour in contemporary digital platform ecosystems.

5 CONCLUSIONS, LIMITATIONS, AND SUGGESTIONS

This research illustrates that combining the TAM with the D&M Information Systems Success Model provides a robust framework for understanding user satisfaction in the realm of e-commerce. The findings indicate that both IQ and SyQ have a significant impact on PEU and PU, which, in turn, influence User Satisfaction. Notably, SvQ emerges as the most critical factor, suggesting that user satisfaction is more significantly affected by the quality of service and overall user experience than by merely functional advantages. Furthermore, PEU serves as a more potent mediator compared to PU,

underscoring the crucial role of user-friendly interactions in shaping user perceptions. Considering these insights, it is recommended that e-commerce platforms focus on enhancing service responsiveness, improving system usability, and ensuring information accuracy to boost user satisfaction. Nonetheless, this study has limitations as it is confined to participants from East Java, Indonesia, and employs a cross-sectional approach while omitting other relevant factors like trust and perceived risk; thus, future investigations should aim to broaden the scope by utilizing longitudinal data and including additional variables for a more thorough exploration of user behaviour.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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