Contact, Fulfillment, and Privacy as Key Drivers of Mobile Commerce Success: A SOR-Extended M-S-QUAL Analysis

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Abstract.

Purpose: M-commerce has become crucial for facilitating grocery shopping through delivery services, yet challenges like delayed orders and systems failures continue to hinder user satisfaction and loyalty. There are still lack of research that have investigated in depth both mobile apps service quality and paid attention to the perspective of user behavior in a structured way. This study addresses a gap by uniquely integrating the Mobile Service Quality (M-S-QUAL) and Stimulus Organism Response (SOR) to find out the key drivers for enhancing m-commerce grocery shopping services quality, and analyzing the influence of the m-commerce services quality factors as Stimulus in m-commerce apps to satisfaction felt by users as Organism, and their relationship with loyalty and E-WOM as user Response.

Methods: Using a quantitative approach, 362 Indonesian m-commerce user responses from online survey were analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM). Outer model and inner model was carried out to test the significance between the construct and the strength of the model.

Result: Results show that Contact (β=0.229), Fulfillment (β=0.192), and Privacy (β=0.166) are the most influential factors driving perceived m-commerce service quality that has strong predictive power (R^2=0.804). These findings, which repositions these specific dimensions as primary stimulus within the SOR framework significantly impacts user satisfaction as organism and positively drive both loyalty and E-WOM as response.

Novelty: This study provides valuable insights and a structured perspective to explain post-adoption user behavior in m-commerce delivery. The study offers novel academic insights and practical strategies for enhancing customer service, delivery reliability, and data protection through user-centered design with more attention to factors such as Contact, Fulfillment, and Privacy (Stimulus) to drive user satisfaction (Organism), loyalty and E-WOM (Response).

Keywords: Mobile service quality, M-S-QUAL, M-commerce delivery, SOR, Electronic word of mouth

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INTRODUCTION

Mobile commerce represents an essential element in the structure of e-commerce that allows customers to make buying and selling transactions through mobile devices easily without face-to-face, especially shopping for daily necessities or groceries [1], [2], [3]. A trend underscored by forecasts indicating that global smartphone users will surpass 7.5 billion by late 2026 [4]. Statista Market Insights projects that the number of online shop users in Indonesia will increase until 2027 to reach 244.67 million users [5]. Indonesia serves as a relevant and strategic context for investigating mobile service quality because of its unique position as an emerging digital economy with that projected users [5], with a the-savvy but highly divers user base. Typically, younger shoppers tend to favor online retail over physical stores, motivated by benefits such as time and price savings, convenience, and access to exclusive products [6]. This shows a strong trend towards the adoption of digital technology in online shopping activities. In parallel with this growth, m-commerce has also transformed how Indonesians shop for daily necessities, offering a more practical and on-demand experience, especially through same-day delivery services [7]. However, in the review column of the Google Play Store of one of the online shopping applications from the largest retail company in Indonesia, many users feel the problem of orders that are delayed for almost 2 hours or more and there is no clarity of information regarding the solution. It is mentioned that there are still often problems with filter features that do not work properly, multi-login problems, force closes, and transactions that sometimes fail [8].

The role of satisfaction with e-commerce highlights the need for developers and service providers to routinely optimize system features, particularly in terms of user interface (UI) and user experience (UX) to

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support a seamless and comfortable user experience [9], [10]. Analyzing post-adoption behavior is critical to retaining customer, since satisfaction and ongoing engagement play decisive role in driving business outcomes in the intensely competitive e-commerce marketplace [11], [12]. With appropriate application service quality improvement strategies, the relevant industries can have a solid foundation to develop and improve applications according to the information of user needs and at a cost-effective basis in order to improve user satisfaction and users using the application on an ongoing basis [13], [14]. Therefore, in order to obtain a suitable strategy to improve the quality of m-commerce application services, it is necessary to conduct an analysis according to the user's experience of using the application to find out what key factors most affect users in the use of m-commerce applications of delivery services.

A wide variety of framework models have been used by researchers in the past to analyze the quality of application services and to examine the determinants influencing users' adoption and utilization of applications, such as the Stimulus Organism Response (SOR) model which described in the previous study [15], [16]. The SOR model posits that external stimuli such as service quality shape an individual's internal state, which subsequently drives behavioral responses including application loyalty and electronic word-of-mouth (E-WOM). Positive E-WOM provides firms with strategic opportunities to attract new users and expand market share. As a result, the SOR framework has become a widely adopted theoretical lens in consumer behavior research, including studies of online shopping behavior [17]. Model for measuring service quality, namely Mobile Service Quality (M-S-QUAL) can capture the effectiveness of mobile shopping (m-shopping) and proposes several factors [14], [18], [19], [20]. M-S-QUAL is specifically designed to measure service quality in mobile contexts, encompassing dimensions crucial for user interaction with mobile applications, unlike more general service quality models, making it a robust and context-specific tool for measuring service quality in m-commerce. While individual aspects of m-commerce service quality and consumer behavior have been studied, these remains a critical void in understanding the causal mechanism (stimulus-organism-response) through which specific mobile service quality dimension (M-S-QUAL) drive sustained user engagement and loyalty in the rapidly evolving Indonesian grocery m-commerce landscape. According to Hassan (2024), investigating which M-S-QUAL dimensions stimulate value generating user behaviors is crucial for advancing understanding in emerging markets, which are still insufficiently studied [14].

Based on review of literature, previous studies have not been simultaneously examined in depth both mobile application service quality and also paid attention to the perspective of user behavior in a structured way, and focused on the sustainability of the use of delivery shopping service applications in m-commerce groceries by utilizing the M-S-QUAL and SOR models. This is where the SOR framework comes in. Through SOR, the dimension of m-commerce services (Stimulus) is seen as a trigger that affects the psychological state of consumers in the form of satisfaction (Organism), which then encourages real behavior in the form of loyalty and electronic word-of-mouth (Response). This is especially relevant for mobile shopping apps, whose continued success relies on insights into post-adoption behavior factors encompassed by M-S-QUAL [14]. This study will fill the gap by extending of SOR and the M-S-QUAL model which provides a deeper understanding of the psychological mechanisms that bridge service quality with user behavioral responses, to examine user engagement such as satisfaction, loyalty, and E-WOM with the quality of application services perceived by users in m-commerce as a Stimulus. The M-S-QUAL which captures mobile-specific service quality dimensions and SOR models which elucidates the psychological processes linking service quality to behavioral outcomes is particularly insightful. This combined approach used as a of strong framework models in this study because both are expected to be comprehensively and more structured with stimulus-organism-response that describes how specific mobile service stimuli within the Indonesian m-commerce environment shape user satisfaction and drive sustainable behaviors like loyalty and E-WOM which are vital for market success in a competitive landscape.

The purpose of this study is to find out the key drivers that are important factors for enhancing m-commerce delivery grocery shopping services quality. This study also analyzed the influence of the m-commerce delivery grocery shopping services quality factors as Stimulus in m-commerce applications to satisfaction felt by users as Organism, and their relationship with loyalty and E-WOM as user Response using the M-S-QUAL with the SOR model. Such an integrated understanding is paramount for Indonesian m-commerce providers to develop user-centric strategies that address local challenges and foster long-term user engagement in a market where service reliability is still evolving as key differentiators.

METHODS

A quantitative methodology was employed, using PLS-SEM via SmartPLS software to analyze the relationship among model variables. PLS-SEM is a variance-based approach to SEM, well-suited for complex models, small sample, and data that are not normally distributed [21], [22]. The proposed research model can be seen in Figure 1.
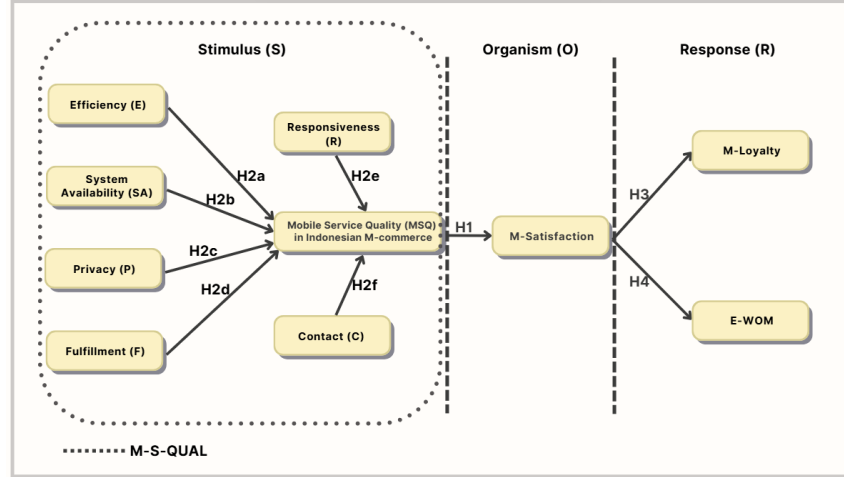

Figure 1. Proposed research model

Data were collected through an online questionnaire, administered in Indonesian using Google Forms. The items were adapted from previously validated studies applying M-S-QUAL, user satisfaction and loyalty constructs under the SOR model, and standardized E-WOM scales [14], [18], [19], [20], [23], [24]. The adaptation aimed to preserve construct validity, ensuring cultural and linguistic appropriateness for the Indonesian m-commerce context. Responses were measured using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Data were collected through an online Google Form, distributed via WhatsApp, Instagram, X, and Telegram. A purposive non-probability sampling method was applied to deliberately select participants whose characteristics matched the research objectives, consistent with best practices in technology adoption research [11], [25]. The questionnaire was targeted at minimum 250 respondents [26] who are application users and have transacted using m-commerce applications for groceries shopping in Indonesia, such as *Alfagift, Klik Indomaret, GoMart, GrabMart,* and similar applications who are 18-40 years old, both male and female, and have experience shopping on the application at least once in the last six months. Ligaraba et al. (2023) identify young adults as utilitarian consumers whose unmet functional needs can be satisfied through the practical advantages of online retail services [27]. Within the M-S-QUAL framework, these needs are reflected in that dimensions. Addressing these dimensions is essential for eliciting positive internal evaluations (Organism) that lead to behavioral responses such as loyalty and electronic word-of-mouth (E-WOM), as proposed by the SOR model. However, limited empirical studies have specifically examined how these M-S-QUAL dimensions influence satisfaction, loyalty, and E-WOM in the Indonesian m-commerce context, leaving an important gap for further investigation.

After the questionnaire data is collected, initial data screening was conducted to ensure data quality and integrity prior to analysis. This involved identifying and addressing missing values, as well as detecting problematic response patterns such as constant scale, increasing scale, and decreasing scale which may indicate a lack of genuine engagement or random responding. Then, data processing and analysis is carried out using the PLS-SEM method [21], it is a multivariate inferential statistical analysis to find out the relationship between variables. PLS-SEM consists of the first analysis, namely the outer model (measurement model) with an outer loading value > 0.7 and the reliability test with a Composite Reliability (CR)>0.7. In Equation 1, l_i represents the standard outer loading of the indicator variable i of a particular construct measured by the M, e_i is the measurement error of the indicator variable i, and $var(e_i)$ indicates the variance of measurement error. Composite Reliability (CR) is superior to measure reliability because it takes into account the weight of the indicator in the PLS-SEM model. A CR value above 0.7 indicates good reliability [22]. The composite reliability can be measure with Formula (1).

$$\rho\,c = \frac{\left(\sum_{i=1}^{M} l_i\right)^2}{\left(\sum_{i=1}^{M} l_i\right)^2 + \sum_{i=1}^{M} var(e_i)} \tag{1}$$

For the validity test with the Fornell-Larcker criterion and Average Variance Extracted (AVE). In Equation 2, an AVE ≥ 0.50 indicates that the construct explains more than half of the variance of its indicators, whereas an AVE < 0.50 suggests greater error variance than explained variance. The AVE formula can be shown in Formula (2).

$$AVE = \left(\frac{\sum_{i=1}^{M} l_i^2}{M}\right) \qquad (2)$$

Then the second analysis, namely the inner model (structural model) to test the significance of the path coefficient (t statistics>1.96 and p-value<0.05) for the hypothesis test. It is important to note that the variance inflation factor (VIF) for predictor constructs should remain below 5 and ideally below 3 to ensure that collinearity does not bias the structural model's estimates [21], next, the value of the coefficient determination of R2 with R2>0.67 (strong); R2 between 0.33–0.67 (moderate); and R2 between 0.19–0.33 (weak) [28], the effect size value of f2 with f2≥0.35 (large); f2 between 0.15–0.35 (medium); f2 between 0.02–0.15 (small) [22], the Q2 predictive relevance value>0, and the SRMR (goodness-of-fit) model is < 0,1 or ≤0.08, d_ULS>0.05, and d_G>0.05 [28], [29], [30].

Research Hypotheses
Researchers applied M-S-QUAL to study mobile service quality in fashion retail m-commerce and found that responsiveness and efficiency influenced user satisfaction [14], [20]. This satisfaction strengthened loyalty and encouraged positive E-WOM, which was shown to significantly influence purchasing decisions, underscoring the importance of satisfied users as advocates of mobile shopping platforms. [14], [31], [32]. In other mobile retail, specifically Meng and Sego (2020) explored the link between contact, responsiveness, fulfillment, and efficiency as mobile retail service quality dimensions, customer satisfaction, and three behavioral outcomes: repurchase intent, word-of-mouth, and price sensitivity [33]. Other research [34] use the mobile service quality variable not only discusses the relationship between service quality and user satisfaction, but also on the impression on the organization. In addition, in the context of online food purchase services, personal innovation in using digital technology plays a role in increasing their satisfaction with the services offered [35], the quality of mobile app service has a significant spillover effect on food satisfaction and repurchase intent [36]. On online groceries, Hendry et al. (2024) found that user satisfaction and perceived usability affect users' continued intent towards online grocery applications [37]. While contact, security, privacy, and fulfillment quality affect user satisfaction [38], [39].

Many researchers affirmed that service quality and user satisfaction are factors that support the successful implementation of m-commerce applications [19], [40]. By improving the quality of mobile or mobile services, it can foster user satisfaction and increase the repurchase rate [41], [42]. The effectiveness of the application and its capacity to address user needs have a substantial positive impact on customer satisfaction [43] and satisfaction is an important concern for business organizations to exist and grow [44]. Research by Arizal et al. (2025) ensuring the level of loyalty of e-commerce users in Indonesia towards their online purchases by examining the importance of the quality of service elements, with trust acting as a mediator [45]. Meanwhile, Hutahaean et al. (2024) examine the usability model in m-commerce that combines functional and non-functional attributes [46]. Results suggest that efficiency, satisfaction significantly explain users' perceptions of the usefulness of m-commerce applications [47].

The unique characteristics of mobile sites, which differ substantially from other sales channels, necessitate the development of a dedicated service quality scale for m-commerce. Huang et al. (2015) developed the M-S-QUAL framework to evaluate mobile service quality for both virtual and physical products [18]. Following a five-stage validation process, the M-S-QUAL model was established, comprising several dimensions. Efficiency, as one of these dimensions, evaluates the extent to which the mobile application is quick to respond and easy to navigate [18], [34], [48], [49]. System availability is a crucial dimension of service quality that states the technical functionality of the applications [24], [48]. Privacy measures how secure customers perceive the application to be and the degree of protection afforded to their personal information [24], [48]. Fulfillment assesses the extent to which the suitability of the mobile application regarding order delivery and availability of goods is met [14], [18], [19], [20]. Responsiveness measures the effectiveness of the mobile service in resolving problems and implementing return [14], [18], [19], [20]. Contact indicates the availability of telephone assistance and online representatives [14], [18], [19], [20].

H1: Mobile Service Quality positively affects the M-satisfaction felt by users.
H2a: Efficiency positively affects the Mobile Service Quality that users feel.
H2b: System Availability positively affects the Mobile Service Quality that users feel.
H2c: Privacy positively affects the Mobile Service Quality that users feel.

H2d: Fulfillment positively affects the Mobile Service Quality that users feel.
H2e: Responsiveness positively affects the Mobile Service Quality that users feel.
H2f: Contact positively affects the Mobile Service Quality that users feel.

Some studies might focus solely on service quality dimensions without delving into the psychological mechanisms that drive user responses. This study, by combining M-S-QUAL with SOR model offers a more nuanced understanding of the why behind user behavior. Stimulus-Organism-Response (SOR) is a theoretical framework that describes how external stimuli affect the psychological state of individuals (organisms) and ultimately produce specific behavioral responses [50], [51]. The SOR framework was developed by Mehrabian and Russell in 1974, explaining that external stimuli can affect organisms from within, which then have a direct effect on the behavior displayed by the individual, the stimulus can be defined as any factor that affects the internal state of the consumer [15], [52]. The SOR framework was applied in a study on the influence of online reviews on customer purchase intent by Zhu et al. (2020) [51]. This SOR model is often used to explain consumer behavior, one of which is in the adoption of m-commerce conducted by Yaqub et al. (2024) [15]. Scholars often use platform characteristics (e.g., service quality) as stimuli and cognitive emotional responses as internal variables to investigate their effect on user intent and repurchase intention [53]. This cognitive or emotional factor is in the form of user satisfaction which then affects the user's response, namely the continuous intention to use the application or service [54].

In the context of digital consumer behavior, Hewei and Youngsook (2022) mentioning that the stimulus (S) includes external factors, such as social media interactions, quality of service, or online shopping experience [50]. Meanwhile, Organism (O) refers to the psychological and emotional mechanisms that occur in individuals, such as value perception, immersive experiences, or satisfaction levels. Then, the response (R) describes the behavior generated, such as the intention to buy back, brand loyalty, or the decision to use a service on an ongoing basis. Another response is E-WOM [14]. Electronic Word of Mouth (E-WOM) denotes the exchange of customer opinions online via reviews, recommendations, or comments that impacts others' purchase choices on digital platforms [14], [55], [56]. According to Giang et al. (2024) and Sahadev et al. (2025) [57], [58], users also show greater engagement in E-WOM including behaviors, such as writing reviews and recommending products to others. Thus, SOR provides a structural perspective to analyze how the user experience in the digital application can be modified through various external factors to increase user satisfaction and loyalty to use the application [15]. This allows for a more holistic and casually-driven analysis of sustained user engagement.

H3: M-satisfaction positively affects users' M-loyalty.
H4: M-satisfaction positively affects E-WOM.

RESULT AND DISCUSSION

From the questionnaire distributed, 374 respondents were obtained. Then after data cleaning, as many as 12 respondent data were removed due to invalidity or failure to meet the specified criteria, such as age of the respondents over 40 years old and problematic response pattern like constant scale, increasing scale, and decreasing scale. So that, there is a total of 362 respondents data used for analysis. From the research that has been conducted, Table 1 shows that female users (70.4%) dominate the respondents, showing that female are the main users of m-commerce services in this study. Male users (29.6%) are in the minority. This reflects more active digital shopping behavior in women, especially for household and daily necessities. The majority of respondents were between 18–27 years old (70% of the total): 23–27 years old (39.7%) and 18–22 years old (30.3%). This show the user population is dominated by the younger generation and early adults who are very familiar with shopping technology and apps. Routine use is quite high, which is ≥2 times/week in total as much as 74.5%. Only 1% of respondents use m-commerce sporadically (once per month or if necessary), indicating that the majority have made apps part of their shopping routine. *Alfagift* (32.1%), *Klik Indomaret* (23.4%), and *GoMart* (17.4%) are the three most popular applications.

Table 1. Respondent profile

Respondent Profile	Total	Percentage
Gender		
Female	255	70.4%
Male	107	29.6%
Age		

Respondent Profile	Total	Percentage
18 - 22 years	110	30.3%
23 - 27 years	144	39.7%
28 - 32 years	71	19.6%
33 - 37 years	23	6.3%
38 - 40 years	14	3.8%
Frequency using m-commerce		
≤1 time in one week	79	21.8%
2 times in one week	122	33.7%
3 times in one week	112	30.9%
4 times in one week	36	9.9%
> 5 times in one week	9	2.4%
1x in a month	2	0.5%
If there are many needs	2	0.5%
Application		
Alfagift	221	32.1%
GoMart	120	17.4%
GrabMart	110	15.9%
Klik Indomaret	161	23.4%
My Superindo	72	10.4%
Other	4	0.58%

In the first stage of analysis, the outer model was evaluated to determine the validity and reliability of the indicators and constructs. Indicators with loadings between 0.40 and 0.70 were considered for removal only if their exclusion improved internal consistency or convergent validity. As presented in Table 2, all ten constructs satisfied the recommended measurement thresholds, with most indicators loading above 0.70, and all constructs achieving AVE > 0.50 and CR > 0.70. Composite reliability values ranged between 0.70 and 0.90, indicating satisfactory internal consistency [21]. Discriminant validity was confirmed using the Fornell–Larcker criterion, as the square root of each construct's AVE exceeded its highest inter-construct correlation, thereby verifying the model's measurement quality.

Table 2. Analysis of outer model

Construct	Indicator	Convergent Validity		Composite Reliability
		Outer Loading	**AVE**	
Efficiency (E)	E2	0.679	0.604	0.751
	E3	0.864		
System Availability (SA)	SA2	0.781	0.609	0.824
	SA3	0.790		
	SA4	0.770		
Privacy (P)	P2	0.778	0.542	0.780
	P4	0.701		
	P5	0.728		
Fulfillment (F)	F2	0.780	0.630	0.773
	F3	0.808		
Responsiveness (R)	R4	0.769	0.587	0.739
	R5	0.763		

Construct	Indicator	Convergent Validity		Composite Reliability
		Outer Loading	AVE	
Contact (C)	C2	0.750	0.558	0.791
	C3	0.730		
	C5	0.760		
Mobile Service Quality (MSQ)	MSQ2	0.746	0.585	0.738
	MSQ5	0.783		
M-Satisfaction (SAT)	SAT1	0.691	0.566	0.722
	SAT3	0.809		
M-Loyalty (LO)	LO2	0.793	0.639	0.842
	LO3	0.785		
	LO5	0.820		
E-WOM (EWOM)	EWOM1	0.841	0.722	0.838
	EWOM4	0.858		

In the second data analysis, the inner model measurement was carried out. For the model fit can be seen in Table 3, assessed via SRMR < 0.1 or≤0.08, d_ULS>0.05, and d_G>0.05 indicated a good approximation of the data structure [28], [29], [30].

Table 3. Model fit

Criteria	Value	Interpretation
SRMR	0.08	Good fit
d_ULS	1.951	Good fit
d_G	0.653	Good fit

Then for collinearity, in this study it was found that all constructs or variables in the model have a VIF value below 5, which is 1.000 to 2.002. So, it can be interpreted that all variables in this research model are avoided from the critical level of collinearity. Subsequently, the R^2 values were examined to assess the structural (inner) model, as presented in Table 4. The R^2 statistic indicates the proportion of variance in the dependent variable explained by its corresponding independent variables, thereby reflecting the model's predictive power. The results reveal that Mobile Service Quality achieved an R^2 of 0.804 (80.4%) and M-Satisfaction an R^2 of 0.684 (68.4%), suggesting that the predictors incorporated in the model explain a substantial proportion of variance in these constructs. These findings demonstrate that the model possesses strong predictive relevance for both mobile service quality and user satisfaction. Next F-square shows the contribution of each predictor can be seen in Table 4. In the MSQ, the largest contribution came from SA (0.281), followed by R (0.186), F (0.177), and P (0.161) in the moderate category. C (0.070) exerts a small influence, while E (0.002) is very small. The relationship between MSQ and SAT has a very large influence (2.162) indicating that service quality plays a dominant role in shaping satisfaction. The SAT to EWOM is also strong (0.442), while the SAT to LO is only small (0.0420 indicates that loyalty is not entirely dependent on satisfaction alone. The Q^2 statistic was employed to assess the predictive relevance of the model, as presented in Table 4. Q^2 values greater than zero indicate that the independent variables possess predictive power for the associated dependent variables. In this study, all Q^2 values ranged from 0.055 to 0.277, confirming that the model demonstrates acceptable predictive capability.

Table 4. R-Square, F-Square, Q-Square value

	Construct	Value	Interpretation
R square	**MSQ**	**0.804**	**Strong**
	SAT	**0.684**	**Strong**

	Construct	Value	Interpretation
	LO	0.040	Very weak
	EWOM	0.306	Weak
F square	**C → MSQ**	**0.070**	**Small**
	E → MSQ	0.002	Very small
	F → MSQ	**0.177**	**Medium**
	P → MSQ	**0.161**	**Medium**
	R → MSQ	0.186	Medium
	SA → MSQ	0.281	Medium
	MSQ → SAT	**2.162**	**Large**
	SAT → LO	**0.042**	**Small**
	SAT → EWOM	**0.442**	**Large**
Q square	**MSQ**	**0.277**	**Predictive**
	SAT	**0.150**	**Predictive**
	LO	**0.055**	**Predictive**
	EWOM	**0.075**	**Predictive**

Figure 2 shows the results of the structural analysis and Table 5 demonstrates the results in more detail regarding the overall hypothesis that has been tested. The structural model results reveal that six out of nine proposed hypotheses (H1, H2c, H2d, H2f, H3, H4) were statistically supported, indicating that Privacy (β=0.166, T=2.605, p=0.009), Fulfillment (β=0.192, T=3.567, p=0.000), and Contact (β=0.229, T=3.001, p=0.003) significantly influence perceived Mobile Service Quality (MSQ). And then, Mobile Service Quality (β=0.396, T=7.343, p=0.000) significantly influence M-Satisfaction, M-Satisfaction significantly influence M-Loyalty (β=0.339, T=6.034, p=0.000) and E-WOM (β=0.407, T=7.644, p=0.000). On the other hand, Efficiency (H2a), System Availability (H2b), and Responsiveness (H2e) did not have statistically influence and did not have significant effects.

This study successfully identifies and prioritizes the key factors influencing the use of m-commerce and highlights a structured stimulus-organism-response model. Contact (H2f), Fulfillment (H2d), and Privacy (H2c) are the most influential factors as a Stimulus in the mobile service quality felt by users. Contact positively affects mobile service quality. The better the availability of contact services to users such as customer service or live chat, the higher the perception of the quality of mobile services felt by users. Users can use the live chat feature in the application, call center, as well as online complaint forms and emails on each m-commerce application. These results are in line with research [32], [39], [49] which shows that the direct connection to customer service greatly affects the user experience. These findings are consistent that contact builds a sense of security and trust because users feel that there is a party ready to help when problems occur. Fulfillment was found to exert a positive influence on mobile service quality. Improved fulfillment reflected in the reliability of delivery promises and the availability of products enhances users' perceptions of application service quality. Thus, fulfillment is confirmed as a key driver shaping perceived mobile commerce service quality. This is in line with previous research [33], [36]. Ensuring transparency regarding estimated delivery times and product availability is therefore a critical determinant of users' perceptions of mobile service quality.
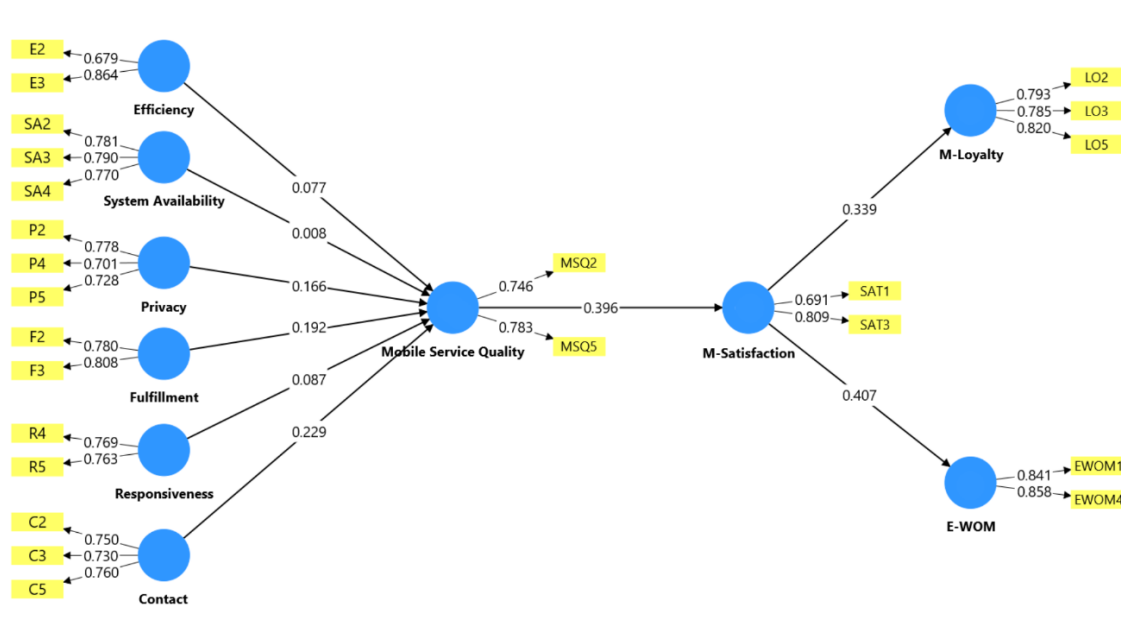
Figure 2. Structural analysis

Another significant factor identified is Privacy, which also exhibits a positive effect on mobile service quality. When users perceive that an m-commerce application adequately safeguards their personal information, their evaluation of the overall service quality increases. These findings are consistent with the results of previous studies, reinforcing the importance of fulfillment and privacy as key dimensions of mobile service quality [32], [38], [49]. It is stated that privacy is a critical dimension in the perception of mobile service quality, especially in mobile commerce which often involves personal data and digital payments. M-commerce applications that provide data security assurance, transparent privacy policies, and prompt handling of security incidents will receive a high quality of service rating. The significant influence of Contact, Fulfillment, and Privacy on Mobile Commerce Service Quality challenges a purely functional view of service quality, suggesting that relational and trust-building aspects are paramount. This extends the understanding of m-commerce service quality beyond mere efficiency or system availability which are often considered baseline requirements.

Table 5. Hypothesis testing results

	Path coefficient (β)	T-statistics	P-values	Decision
H1: MSQ → SAT	**0.396**	**7.343**	**0.000**	**Supported**
H2a: E → MSQ	0.077	1.323	0.186	Not supported
H2b: SA → MSQ	0.008	0.129	0.898	Not supported
H2c: P → MSQ	**0.166**	**2.605**	**0.009**	**Supported**
H2d: F → MSQ	**0.192**	**3.567**	**0.000**	**Supported**
H2e: R → MSQ	0.087	1.594	0.111	Not supported
H2f: C → MSQ	**0.229**	**3.001**	**0.003**	**Supported**
H3: SAT → LO	**0.339**	**6.034**	**0.000**	**Supported**
H4: SAT → EWOM	**0.407**	**7.644**	**0.000**	**Supported**

The findings proven that mobile service quality positively affects the mobile satisfaction felt by users (H1). These findings indicate that higher user perceptions of mobile commerce service quality are associated with increased levels of satisfaction. The results align with prior research demonstrating that service quality across diverse digital m-commerce contexts significantly influences users' satisfaction [14], [19], [20], [34], [35], [40]. Mobile satisfaction also positively affects the mobile loyalty felt by users (H3). These results show that the higher the user satisfaction with the mobile commerce application, the higher the loyalty of the user, they plan to shop more often via the application. This illustrates that loyalty is not only a repurchase but also a

priority for platform selection because it has been in accordance with what they consider to be suitable for the needs and perception of superior mobile service quality that they feel. The results reinforce prior research, confirming similar patterns observed in earlier studies [14], [16], [19], [20], [31], [35], [37]. It is also evident that satisfaction positively affects the user's E-WOM (H4). This means that the positive experience of using mobile commerce services that meet user expectations triggers the user's encouragement to share information and recommendations on social media, electronic forums, or to personal networks. These results corroborate the findings of prior research [14], [31]. The study also shows that satisfied users are more likely to share positive recommendations, both on social media and review platforms.

The results of the study show that application efficiency has no effect on the perception of overall mobile commerce service quality (H2a). In m-commerce, *Alfagift* and *Klik Indomaret* provide clear product category navigation, easily accessible promo icons, and a quick search system. However, this look and performance are relatively equal in both and offer less of a big differentiation than the competitors. The outcomes of this study are in alignment with earlier empirical evidence reported in the literature [46], [47]. It has been reported that efficiency significantly influences satisfaction and continued usage intention when there are noticeable variations in application performance. However, when applications within the same category exhibit relatively similar performance levels, the effect of efficiency on perceived mobile service quality becomes weaker. User perception of system availability, in this study did not have a significant influence on the perception of overall m-commerce service quality (H2b). Features and technical stability in m-commerce apps are relatively standard across all platforms. There are only occasional maintenance glitches and users consider these glitches to be normal, even though the potential for bugs or freezes is high. This is in line with prior research [36], [45], it was stated that system design or system availability does not exert a significant influence on users, as the user emphasizes on the aesthetic features of the functional mobile application (the mobile application of online food delivery). Users tend to think of system availability as a baseline requirement. Prasetyo et al. (2023) stated that system availability does not have a positive effect because customers who use applications are fine with these dimensions or variables [43]. Responsiveness also has no significant effect on mobile service quality (H2e). The application's ability to handle problems, for example, to provide guidance if a transaction fails, only contributes weakly to the perception of service quality in this study sample. These findings are the same as previous research [32], [36] in m-commerce with online food delivery services. The role of responsiveness is not significant when the main function of the application is running smoothly. Next is Responsiveness also becomes important when problems occur. Responsiveness denotes the provider's willingness to offer immediate assistance and deliver services within the expected timeframe [44]. In this case, users rarely experience transaction failures, so the variability of this responsiveness perception is small, so the statistical effect is weakened. In addition, responsiveness functions more as a "hygiene factor", responsiveness as a basic requirement rather than an added value differentiator [11]. This contrasts with other research where these factors were significant [14], [24]. This suggests that in the Indonesian m-commerce delivery grocery shopping application context, these elements are expected perquisites, implying that user satisfaction is more driven by factors that offer a clear competitive advantage.

Within the SOR framework, the stimulus is represented by mobile service quality factors such as efficiency, system availability, privacy, fulfillment, responsiveness, and contact which affect the organism, namely user satisfaction. This internal state subsequently drives the response, manifested as loyalty and the long-term intention to continue using the application. Good mobile service quality factors are able to provide stimulus to users as organisms to feel satisfaction and finally produce a positive response in the form of E-WOM. In this study, it was found that Contact, Fulfillment, and Privacy as key driving factors for m-commerce service quality are the most powerful stimulus for users as organisms in feeling satisfaction and providing responses in the form of loyalty and E-WOM. Thus, this study offers a comprehensive understanding of the fundamental mechanisms of the service quality of m-commerce applications for delivery shopping that affect satisfaction, loyalty or long-term repeat use of applications, and positive E-WOM. This research has provided an extended structured framework model that can serve as a foundation for future research with Contact, Fulfillment, and Privacy as a stimulus that needs to be considered to enhance the quality of m-commerce services so that user satisfaction, loyalty, and E-WOM increase. The model demonstrates strong predictive capabilities, as evidenced by the R-square and Q-square evaluation criteria.

This study offers a theoretical contribution by repositioning Contact, Fulfillment, and Privacy as primary drivers of Mobile Service Quality within the SOR framework, specifically in the context of m-commerce grocery delivery in Indonesia. Although traditionally seen as an add-on, Contact emerged as the most influential factor, highlighting the importance of personalized and accessible support and in a market where digital trust is still growing. In addition, insignificant factors such as Efficiency, Responsiveness, and System

Availability suggest these factors have become basic expectations, reinforcing the idea that users focus on differentiators such as Fulfillment only when basic functions are stable. Then the importance of the Privacy factor emphasizes the increasing relevance of user trust-based service quality models in emerging markets, where data security and transparency are now at the center of user evaluation. This underscores a theoretical shift towards understanding how perceived security, reliability of service delivery, and accessible human support become central to user behavior models in the digital m-commerce especially where digital trust is still evolving. In practical terms, the findings in this study show a strategic enhancement priority for m-commerce application developers. Comprehensively, the priority of factors can be seen in Table 6.

Table 6. Priority recommendation M-commerce service quality factors

Factor	Original sample (O)	Recommendation
Contact	0.229	Improve accessibility and customer support integration with in-app assistance or live chat and call functions on couriers/drivers to provide instant, human-like responses in person.
Fulfillment	0.192	Improve transaction reliability and delivery accuracy by providing courier journey maps when goods are delivered and add feature for product changes via chat.
Privacy	0.166	Communicate the privacy policy clearly, especially during onboarding and transactions, on the initial page of registration.

CONCLUSION

The results from this research supported that Contact (β=0.229), Fulfillment (β=0.192), and Privacy (β=0.166) are the most salient determinants of perceived mobile service quality. This research has provided new theoretical insights on the M-S-QUAL model in the SOR framework to understand the mobile service quality factors as Stimulus that affect user satisfaction as Organism, loyalty and E-WOM as Response for improvement strategies of m-commerce delivery shopping service. The research advances theoretical understanding of how Contact, Fulfillment, and Privacy on mobile service quality (stimulus) drives user satisfaction (organism), which subsequently fosters loyalty and electronic word-of-mouth (response). These findings position Contact, Fulfillment, and Privacy as strategic levers for enhancing user-centered m-commerce design and strengthening customer engagement in the Indonesian m-commerce delivery context. Nevertheless, the study's limited sample scope may restrict generalizability, highlighting the need for future research to incorporate cultural and technological readiness variables to better capture user behavior across diverse service categories.

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