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Research Article

The Nexus Between Service Quality and Self-service Technology on Customer Satisfaction and Continuance Intention: A Survey on Trans-Java Toll Road Users

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Abstract.

Drawing upon Social Cognitive Theory as its theoretical foundation, this study examines how service quality and self-service technology (SST) interconnect to shape customer satisfaction and continuance intention. Utilizing a quantitative approach, the study employs Partial Least Square (PLS) analysis to uncover relationships within the data. The investigation reveals that while service quality and SST demonstrate substantial positive impacts on user satisfaction, neither factor directly influences continuance intention. The findings indicate a complex relationship wherein both service quality and SST enhance customer satisfaction, though supplementary elements appear to shape long-term loyalty decisions. Notably, user satisfaction emerges as the critical full mediator between service quality/SST and continuance intention, functioning as the essential channel through which these factors influence users' ongoing engagement. This discovery suggests that elevating service quality or SST independently proves insufficient for maintaining customer commitment without prioritizing user satisfaction. The research yields meaningful theoretical and practical implications, emphasizing how a strategic focus on user satisfaction mediates between service quality and self-service technologies to foster customer loyalty and sustained engagement.

Keywords: continuance intention, customer satisfaction, self-service technology, service quality, social cognitive theory

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1. Introduction

The Trans-Java toll road, a vital infrastructure project connecting significant cities across Java, has become a cornerstone for inter-city connectivity and economic advancement. As one of Indonesia's most ambitious transportation initiatives, it has dramatically shortened travel durations between regions, enabling the efficient movement of goods and services, which in turn boosts economic productivity. Nevertheless, the success of this toll road network hinges not merely on its physical presence but on its ability to fulfill user expectations and ensure their satisfaction. Within the modern competitive transport industry, user satisfaction serves as a key determinant shaping consumer behavior,

especially in relation to service continuance intention. Service quality and self-service technology integration emerge as essential elements that shape customer satisfaction and influence ongoing toll road usage [1].

The level of service quality plays a fundamental role in shaping customer satisfaction by encompassing users' comprehensive interactions with provided services. Parasuraman et al. [1] established that service quality emerges from the comparison between anticipated and delivered service experiences. The alignment or surpassing of expected quality standards leads to heightened user satisfaction, subsequently fostering sustained participation. In the realm of toll road operations, aspects such as road maintenance, the availability of rest areas, safety measures, and smooth traffic flow are vital elements of service quality. However, given the evolving nature of customer expectations, toll road operators must consistently enhance their services. Failure to adapt may lead to dissatisfaction among users and a shift toward alternative options, such as non-toll roads [2].

Beyond service quality considerations, self-service technology (SST) has emerged as a crucial factor influencing customer experiences, especially in toll road operations. The implementation of self-service technology, exemplified by electronic toll collection systems (ETCs), facilitates smoother toll road navigation through decreased queue times and improved travel convenience. The introduction of SSTs in toll road operations aligns with broader technological advancements in transportation infrastructure aimed at improving efficiency and user satisfaction. Studies by Bitner et al. [3] highlight the importance of SSTs in modern service delivery, noting that these technologies not only increase operational efficiency but also empower users by giving them greater control over their service experience. When users perceive self-service technology as efficient and easy to use, it contributes positively to their overall satisfaction and strengthens their intention to continue using the service [4, 5].

An investigation into how service quality and self-service technology affect customer satisfaction and continued usage patterns of the Trans-Java toll road forms the core of this analysis. Operating within the Social Cognitive Theory (SCT) framework, this investigation explores the ways external elements shape user perceptions and behavioral patterns in transportation contexts. The theoretical foundation established by Albert Bandura in 1986 through SCT offers a robust structure for understanding toll road usage behaviors in transportation service environments. The theory asserts that human behavior arises from the dynamic interaction between personal factors (cognitive, emotional, and biological), environmental conditions, and individual actions. Moreover, SCT

highlights that individuals are not merely passive recipients of environmental influences; they actively contribute to and modify their surroundings through their actions.

In the context of toll road usage, SCT suggests that individuals learn behaviors and develop attitudes toward transportation options by observing the actions and consequences faced by others in similar contexts [6]. For instance, if a user frequently sees others opting for self-service payment kiosks at toll booths and experiences their convenience, they may be motivated to adopt that behavior, mainly if their observations yield positive outcomes, such as reduced waiting times and increased efficiency [7]. Conversely, suppose the majority of users in a community express frustration with these technologies. In that case, it may discourage others from using them, reinforcing negative perceptions and compliance with social norms against using SSTs. Although SSTs are integral to enhancing the convenience of toll road usage, they often receive less design focus compared to other technological innovations. Automated payment infrastructure, such as electronic toll systems, remains peripheral to the expertise of urban development professionals and engineering specialists. These systems receive minimal focus from digital interface experts and interaction design specialists. Consequently, numerous SSTs lack the intuitive functionality found in more prominent innovations like self-driving automobiles or immersive virtual environments [8, 9, 10].

Research shows that despite the prevalence of SSTs, users frequently report negative experiences. For example, over eight decades of self-service parking meters have consistently elicited feelings of frustration among users [4]. This points to a gap in usability and design that must be addressed to enhance user experiences and satisfaction. SCT also highlights the importance of self-regulation in shaping user behavior. According to Bandura [6], individuals are guided by internal standards and self-assessments. Users who encounter a seamless experience with self-service toll collection are more likely to engage in positive self-regulation, reflecting on their experiences and sharing these with others. This positive reinforcement can further encourage the adoption of similar behaviors in others, promoting a cycle of positive observational learning.

Furthermore, SCT posits that individuals can form emotional attachments to certain behaviors, including how they engage with toll roads. For instance, consistent positive interactions with self-service kiosks may lead to emotional associations with convenience and efficiency. Conversely, repeated negative experiences may foster resentment and avoidance of SSTs altogether. Understanding these dynamics is crucial for service providers aiming to optimize customer satisfaction and enhance the overall experience of toll road users.

The relationship between service quality and customer satisfaction reveals contradictory findings across existing literature. While investigations by Razak et al. [11] and De Leon et al. [12] established that service quality significantly affects satisfaction, particularly when enhancing safety and accessibility, Park et al. [13] discovered minimal correlation, indicating that alternative factors like cost may be more influential. Research findings have been mixed: while Vasić et al. [14] demonstrated that shorter journey durations positively impact satisfaction levels, Kim et al. [15] discovered no substantial correlation. The scarcity of comprehensive studies examining these variables' collective effects on toll road operations presents a research gap. Our investigation seeks to fill this void by generating knowledge that could inform approaches for improving customer experiences and strengthening user commitment to toll road facilities.

2. Literature Review

2.1. Social cognitive theory (SCT)

In 1986, Bandura [16] developed Social Cognitive Theory (SCT) as an advancement of Social Learning Theory, explaining how individual conduct emerges through the continuous interaction between personal characteristics (including cognitive, emotional, and biological elements), surrounding conditions, and behavioral patterns. SCT posits that individuals are not merely shaped by their environment; they also possess the capability to modify and influence their surroundings.

Social Cognitive Theory (SCT) emphasizes behavioral change and learning through observation and imitation of actions and behaviors within an environment. Education aims to model children's behavior to reflect socially acceptable norms, attitudes, and values. Since different norms may be accepted in various communities, social sciences focus on studying human ways of life within their immediate communities. They seek to transmit these to younger generations to ensure continuity. Quinnell et al. [17] propose fostering higher-order thinking skills linked to mindfulness and a positive mindset, enabling individuals to reshape their thought processes and reasoning to support effective decision-making and appropriate actions.

2.2. Service quality

The initial conceptualization of service quality was established by Grönroos [18], who identified three fundamental components: technical quality (outcomes), functional quality (processes), and image. This conceptual foundation subsequently inspired numerous scholars to develop alternative frameworks, such as Gronroos' Nordic Model [18], Parasuraman, Zeithaml, and Berry's SERVQUAL Model [1], Rust and Oliver's Three Component Model [19], and Dabholkar et al.'s Multilevel Model [20]. The SERVQUAL model by Parasuraman has since become the predominant analytical framework within service quality studies.

2.3. Self-service technology

Within socioeconomic research, Zhu et al. [21] define Self-Service Technology (SST) as an automated platform enabling customers to execute transactions autonomously, eliminating the need for staff interaction. According to research [22], SST emphasizes consumer participation as a key contributor to service delivery. Similarly, Fitzsimmons [23] characterizes SST as a service interaction facilitated through technology. The integration of computer technology, telecommunications, and the internet has become increasingly prevalent across various service delivery contexts, particularly in retail settings [24]. Meuter et al. [25] further define SST as a technological medium enabling consumers to deliver services on their own without direct employee participation.

2.4. Customer satisfaction

Over recent decades, customer satisfaction has become a core principle in marketing theory as consumers have grown increasingly discerning and demanding. While multiple scholars have sought to conceptualize customer satisfaction, Engel et al. [26] characterize it as an affective outcome ranging from contentment to dissatisfaction that arises when individuals evaluate actual service delivery against their preconceived expectations. The degree of alignment between anticipated and experienced performance ultimately shapes satisfaction levels. If the service falls short of expectations, dissatisfaction occurs; conversely, if the performance exceeds expectations, customers experience high satisfaction or even delight. Within this framework, customer satisfaction plays a vital role in delivering and enhancing value for consumers.

2.5. Continuance intention

According to Fishbein and Ajzen [27], intention represents a person's anticipated probability of executing specific actions. In scenarios where direct behavioral measurement proves impossible, intention serves as a vital indicator [28]. Research by Teo and Zhou [29] in technology adoption studies demonstrates that intention signifies one's willingness to embrace new technologies. Consequently, continuance intention encompasses an individual's sustained commitment to utilize specific products or services over time [30].

3. Material and Methods

The research methodology adopted a quantitative framework, following Creswell and Creswell's [31] definition of quantitative research as an objective approach for evaluating theoretical connections among variables. The investigation specifically examined how service quality and self-service technology impact customer satisfaction and continuance intention within the Trans-Java toll road user population. The quantitative approach was chosen to objectively test the relevant theories by examining how these variables interact to shape customer experiences and behaviors. The respondents for this study were sampled from Trans-Java toll road users, providing a specific focus on those who regularly use the toll road infrastructure. Data were collected through structured surveys, allowing for a detailed analysis of how service quality and the efficiency of SSTs benefits of toll road usage influence customer satisfaction and their intention to continue using the toll road. This methodological approach enables the study to contribute valuable insights into user behavior in the toll road context, offering practical implications for improving service delivery and enhancing customer loyalty. Based on the research model (see Figure 1), the following research hypotheses are proposed:

H1: Service quality positively and significantly effect on user satisfaction.

H2: Service quality positively and significantly effect on continuance intention.

H3: Self-service technology positively and significantly effect on user satisfaction.

H4: Self-service technology positively and significantly effect on continuance intention.

H5: User satisfaction positively and significantly effect on continuance intention.

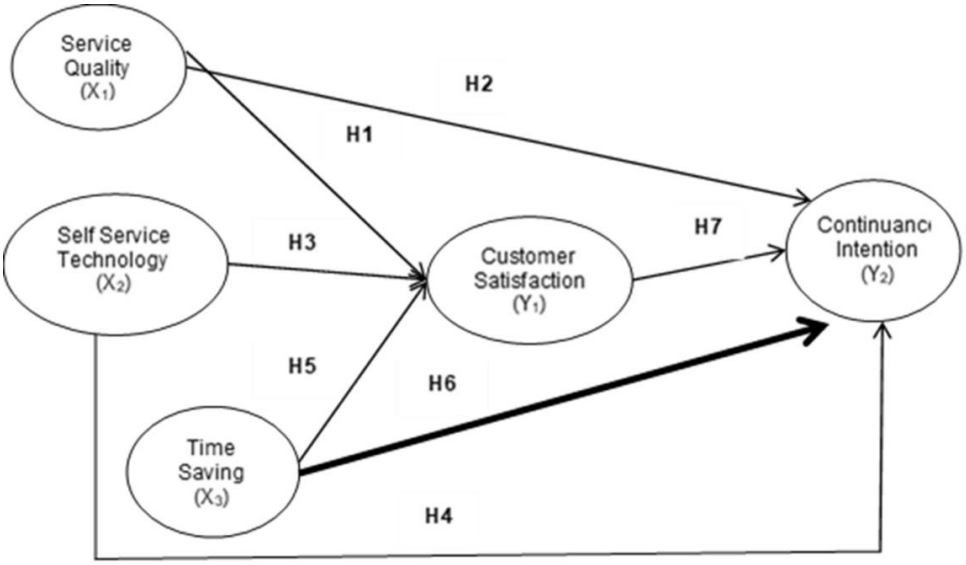

Figure 1: Research model. Source: Authors' own work.

3.1. Data collection and sample

In establishing the research population scope, this investigation adheres to Hair et al.'s [32] recommended protocol of allocating between 5 and 10 participants for each survey question. Given the questionnaire's 32 distinct items, computation yields a participant pool of n = 32 × 10 = 320 individuals. According to Hair et al. [33], the selected sample size meets the criteria for conducting a thorough PLS-SEM analysis. The research encompasses 320 participants, enabling a comprehensive investigation of service quality, self-service technology, customer satisfaction, and continuance intention within the Trans-Java toll road context. The methodology demonstrates compatibility with behavioral research principles and fulfills central limit theorem requirements, supporting result generalizability, as noted by Roscoe [34]. Currently, a preliminary assessment involving 60 participants is being conducted to test the model and enhance the survey instrument. The complete dataset of 320 respondents will yield a comprehensive understanding while reinforcing the investigation's methodological rigor.

The research employed purposive sampling as its primary data-gathering methodology, wherein participants were chosen according to predetermined research-specific requirements. According to Creswell and Creswell [31], this sampling approach enables investigators to deliberately identify subjects possessing particular attributes and relevant experience, thereby yielding comprehensive and valuable information. The participant selection process established key eligibility criteria, primarily requiring individuals to demonstrate recent Trans-Java toll road usage, defined as a minimum of one journey

within the preceding quarter. The selection requirement verifies participants' recent and applicable involvement with highway toll operations. Additionally, participants need experience utilizing self-service technology, including e-toll systems and mobile apps that optimize toll road usage. Such criteria are crucial for assessing how self-service technology influences customer satisfaction and continuance intention.

3.2. Measurement model testing (outer model)

The research methodology incorporated a customized survey instrument developed through the adaptation of existing research materials focused on Trans-Java toll road patrons. Variable constructs were carefully chosen to align with both the study's framework and participant characteristics, ensuring authentic representation of toll road user perspectives. The service quality assessment utilized fourteen distinct metrics derived from Zuna et al. [35], encompassing crucial elements like safety protocols, accessibility features, and operational effectiveness. For evaluating self-service technology, the study implemented six measurement criteria adapted from Ayodeji and Rjoub [36]. The assessment criteria examine how self-service technologies, particularly electronic payment systems and mobile apps, contribute to toll road user convenience.

Regarding customer satisfaction, research incorporated five metrics from Iniesta-Bonillo et al. [37] to evaluate users' overall contentment with toll services and their experiential feedback. The study assessed continuance intention through three distinct measures adapted from Shao et al. [38], examining users' projected long-term commitment to toll road usage. These metrics gauge patrons' probability of maintaining consistent toll road utilization patterns. The research employed a five-point Likert scale (1=strongly disagree to agree 5=strongly) for all measurement constructs, facilitating precise data collection. This methodological framework effectively captures essential factors influencing both customer satisfaction and continuance intention among Trans-Java toll road patrons.

4. Results and Discussion

The demographic characteristics of study participants (n=60) are summarized in Table 1.

The sample composition reveals a predominantly male population (78.3%) versus female participants (21.7%). Analysis of age groups indicates a concentration in the

25-30 year bracket (36.7%), with the next largest group being 31-35 years (26.7%). Geographic distribution highlights participants primarily from three cities: Malang (30%), Mojokerto (23.3%), and Surabaya (21.7%). Professional backgrounds comprise employed persons (33.3%), entrepreneurs (26.7%), and educators (21.7%). Monthly household earnings predominantly fall within Rp3.000.001-Rp4.000.000 (46.7%), while toll road expenditures typically range between Rp300.001-Rp500.000 (41.7%).

Hair et al. [33] emphasize that PLS-SEM analysis yields two fundamental components: the inner and outer models within the structural framework. While the inner model depicts latent variable connections via path matrices, the outer model evaluates measurement quality through validity and reliability metrics. According to Sarstedt et al. [39], reliability assessment in PLS-SEM requires examination of both composite reliability and Cronbach's alpha, with threshold values exceeding 0.7. Our investigation surpassed these benchmarks, achieving composite reliability scores above 0.8 across all constructs: service quality (0.944), self-service technology (0.936), user satisfaction (0.974), and continuance intention (0.946). Parallel findings emerged for Cronbach's alpha, with all measures exceeding 0.8: service quality (0.934), self-service technology (0.918), user satisfaction (0.966), and continuance intention (0.913). For validity assessment, Sarstedt et al. [39] stipulate that average variance extracted (AVE) values must surpass 0.5. Our data confirmed this requirement, with AVE scores for service quality (0.552), self-service technology (0.709), user satisfaction (0.881), and continuance intention (0.854) all exceeding the threshold. Chin [40] notes that these AVE measurements effectively represent latent variable commonality, with values above 0.50 indicating satisfactory results.

Furthermore, Table 2 indicates that the loading factor values (convergent validity) for each construct item are considered valid, as they surpass the 0.7 threshold. However, one item had a loading factor value below 0.7. According to Sarstedt et al. [39], while a loading factor threshold of 0.7 typically indicates validity, measurements falling within 0.4 to 0.7 remain acceptable when composite reliability and AVE metrics satisfy essential validation standards. Consequently, this investigation's loading factor outcomes fulfill the fundamental convergent validity prerequisites.

The evaluation of discriminant validity in this research implements Henseler et al.'s [41] recommended approach, which introduces the Heterotrait Monotrait ratio of correlations (HTMT) as an innovative technique for variance-based PLS-SEM assessment. According to their framework, discriminant validity requires HTMT measurements to fall beneath

TABLE 1: Demography respondent (n=60).

Demographic		Frequency	Percent (%)
Gender	Male	47	78.3
	Female	13	21.7
Age	25 - 30	22	36.7
	31- 35	16	26.7
	36 - 40	7	11.7
	41 - 45	9	15.0
	> 46	6	10.0
Regional of origin	Madiun city	5	8.3
	Surabaya city	13	21.7
	Malang city	18	30.0
	Jombang city	7	11.7
	Mojokerto city	14	23.3
	Batu city	3	5.0
Occupation status	Freelancer	11	18.3
	Teacher/lecturer	13	21.7
	Employed	20	33.3
	Entrepreneur	16	26.7
Net household income	Rp. 3.000.001 - Rp. 4.000.000	28	46.7
	Rp. 4.000.001 - Rp. 5.000.000	10	16.7
	Rp. 5.000.001 - Rp. 6.000.000	14	23.3
	> Rp. 6.000.001	8	13.3
Travel costs using toll roads	< Rp. 300.000	23	38.3
	Rp. 300.001 - Rp. 500.000	25	41.7
	Rp. 500.001 - Rp. 700.000	8	13.3
	> Rp. 700.000	4	6.7

Source: Authors' own work.

0.9 [41]. The data presented in Table 3 confirms this requirement, with all variables exhibiting HTMT values under 0.9, thereby establishing sufficient discriminant validity.

The bootstrapping procedure within PLS-SEM facilitates hypothesis evaluation by producing the internal model, yielding both model-fit metrics and path coefficients. These quantities are used to assess the overall effect of the relationships within the model (see Table 4). Bootstrapping involves resampling the original dataset with replacement to generate multiple simulated samples, thereby improving the reliability of research

TABLE 2: Construct measurement.

Variable	Item	Outer Lodaing	Cronbachs' Alpha	Composite Reliability	AVE
Service Quality	SQ1	0.775			
	SQ2	0.834			
	SQ3	0.883			
	SQ4	0.868			
	SQ5	0.691*			
	SQ6	0.507*			
	SQ7	0.581*			
	SQ8	0.806			
	SQ9	0.839			
	SQ10	0.775			
	SQ11	0.738			
	SQ12	0.836			
	SQ13	0.472*			
	SQ14	0.641*			
			0.934	0.944	0.552
Self-Service Technology	SST1	0.884			
	SST2	0.897			
	SST3	0.817			
	SST4	0.843			
	SST5	0.823			
	SST6	0.783			
			0.918	0.936	0.709
Satisfaction	SAT1	0.931			
	SAT2	0.949			
	SAT3	0.914			
	SAT4	0.939			
	SAT5	0.958			
			0.966	0.974	0.881
Continuance Intention	CI1	0.964			
	CI2	0.960			
	CI3	0.844			
			0.913	0.946	0.854

Source: Authors' own work.

Table 3: Discriminant validity.

	Continuance Intention	Self-Service Technology	Service Quality	User Satisfaction
Continuance Intention				
Self-Service Technology	0.803			
Service Quality	0.491	0.379		
User Satisfaction	0.823	0.884	0.467	

Source: Authors' own work.

results. Through the examination of resampled data, bootstrapping generates highly accurate and reliable estimations, especially when working with complex or limited datasets [33]. This methodology strengthens result validation by revealing patterns of consistency among different samples, reducing systematic errors, and enhancing the credibility and generalizability of research outcomes [42].

The research findings reveal coefficient of determination (R^2) measurements from the partial sequential model, with user satisfaction at 0.751 and continuance intention at 0.711. These R^2 figures demonstrate the model's capacity to explain variance and its interpretative power [43]. In implementing the PLS-SEM methodology, emphasize evaluating path coefficients via R^2 of endogenous constructs, emphasizing both theoretical advancement and construct forecasting. Furthermore, the study's Q^2 value of 0.892, applicable exclusively to endogenous variables, confirms the model's robust predictive capability in examining relationships between exogenous and endogenous variables [43].

Statistical analysis reveals that service quality demonstrates a notable positive correlation with user satisfaction (β=0.162; $p<0.05$) while exhibiting a non-significant relationship with continuance intention (β=0.045; $p>0.05$), validating H1 but not H2. The data also establishes that self-service technology substantially enhances user satisfaction (β=0.792; $p<0.05$), though its direct effect on continuance intention remains statistically insignificant (β=0.111; $p>0.05$), supporting H3 but invalidating H4. The investigation confirms that user satisfaction strongly predicts continuance intention (β=0.849; $p<0.05$), substantiating H5. Further examination demonstrates user satisfaction's complete mediating function between both service quality and continuance intention (β=0.137; $p<0.05$) and self-service technology and continuance intention (β=0.672; $p<0.05$), confirming hypotheses H6 and H7. These outcomes establish user satisfaction as the crucial

intermediary variable in both pathways. Figure 2 illustrates the resultant PLS-SEM model configuration.

TABLE 4: Hypotheses testing.

Hypotheses	Dirrect Effect (β)	Indirect Effect (β)	T Score	P Values	Conclusion
SQ → SAT	0.162		2.327	**0.020**	**Accepted**
SQ → CT	0.045		1.206	**0.228**	**Rejected**
SST → SAT	0.792		15.424	**0.000**	**Accepted**
SST → CI	0.111		1.696	**0.090**	**Rejected**
SAT → CI	0.849		12.754	**0.000**	**Accepted**
SQ → SAT → CI		0.137	2.357	**0.019**	**Accepted**
SST → SAT → CI		0.672	9.678	**0.000**	**Accepted**
R^2=SAT (0.751); CI (0.711)					

Source: Authors' own work.

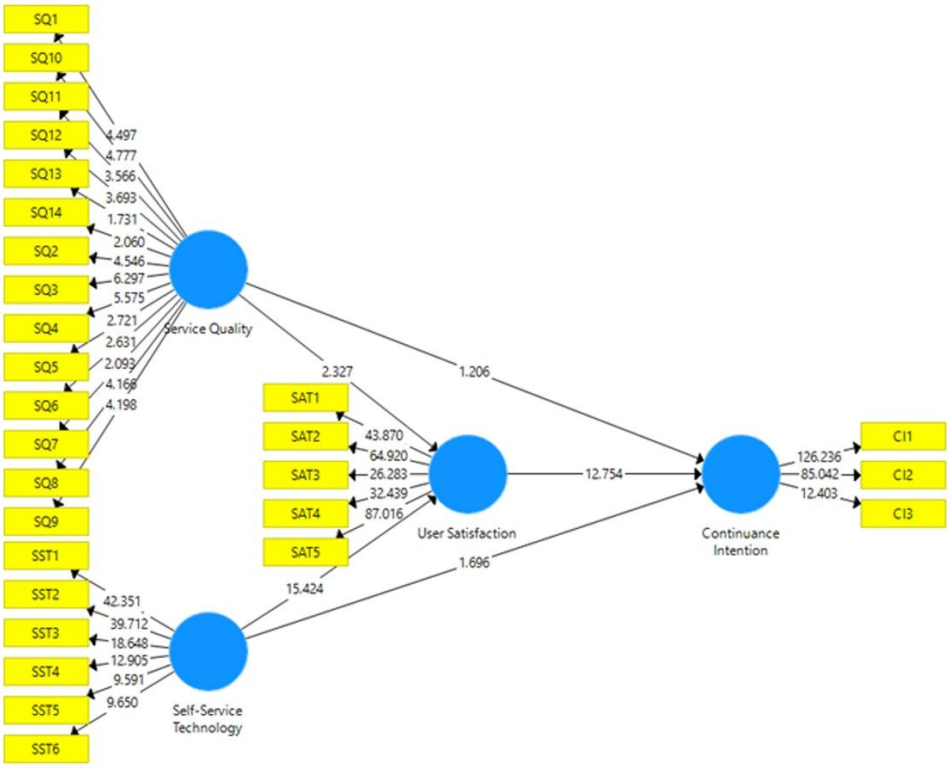

Figure 2: Research model output. Source: Authors' own work.

Research outcomes reveal that service quality exhibits a notable positive correlation with user satisfaction, confirming earlier investigations by Le et al. [44] and Razak et al. [11]. While service quality positively influences continuance intention, the statistical significance is absent, suggesting that superior service quality alone cannot guarantee

customer loyalty. This observation corresponds with Razak et al.'s [11] findings regarding multifaceted retention determinants. Analysis indicates that user satisfaction functions as an intermediary between service quality and continuance intention, echoing previous scholarly work [45]. Research demonstrates that fulfilled expectations lead satisfied customers to maintain service usage [46]. Although service quality remains fundamental for initial user satisfaction, various elements, including operational efficiency and self-service technology, may ultimately determine continuance intention [15]. Therefore, focusing solely on service quality may not be sufficient for ensuring long-term customer loyalty, highlighting the importance of a comprehensive strategy for customer retention. Given the absence of a direct impact on continuance intention, future research could explore potential moderating variables that influence repeat usage behavior.

Self-service technology (SST) has emerged as a key factor in improving customer satisfaction by offering greater convenience, efficiency, and a sense of autonomy. As highlighted by Meuter et al. [25], SST enables users to access services independently, minimizing reliance on staff and potentially enhancing their overall experience. Research conducted by Djelassi et al. [47], supports the notion that customer satisfaction increases when individuals feel comfortable utilizing these technologies. Our research demonstrates that SST exhibits a notable positive correlation with user satisfaction, supporting H3. This observation corresponds with Iqbal et al. [48]'s research highlighting how self-service features enhance customer interaction experiences.

Nevertheless, our analysis reveals no statistically meaningful link between SST and continuance intention, invalidating H4. Despite elevating user satisfaction levels, SST fails to translate into sustained customer loyalty. These results echo the conclusions drawn by Wu et al. [49] and Chuang and Lai [50], indicating that while SST boosts immediate satisfaction, elements like service dependability and value-added benefits emerge as stronger determinants of long-term commitment. These results indicate that while self-service technology is essential for fulfilling short-term customer expectations, additional strategies are necessary to ensure sustained engagement and loyalty.

Customer satisfaction plays a pivotal role in influencing continuance intention, as demonstrated by the hypothesis testing results in this study. Satisfaction encompasses both cognitive and affective components, where the cognitive aspect pertains to customers' perceptions of service quality. In contrast, the affective component relates to the emotions associated with their service experience [51]. Understanding this dual nature is essential in explaining how positive service interactions contribute to both

customer retention and advocacy [52]. The analysis demonstrates that user satisfaction exhibits a substantial positive correlation with continuance intention, validating hypothesis H5. Prior studies have established similar results, indicating that satisfied customers demonstrate a greater propensity to maintain service usage [11, 49]. The robust connection between these variables emphasizes how critical it is to surpass user expectations consistently. Satisfied users demonstrate an enhanced likelihood of both repeated engagement and service advocacy, contributing to long-term customer loyalty.

The investigation explores how user satisfaction functions as an intermediary variable between service quality and continuance intention while also analyzing its mediating effect between SST and continuance intention. Analysis reveals user satisfaction's complete mediating influence in both relationships. The findings demonstrate that user satisfaction fully bridges the connection between service quality and continuance intention, confirming H6. These outcomes align with prior investigations by Razak et al. [11] and Tjiptono and Chandra [45], highlighting satisfaction's vital function in converting service quality into customer loyalty. The research additionally confirms H7, establishing user satisfaction as a complete mediator linking SST to continuance intention. The convenience and ease provided by SST contribute significantly to customer satisfaction, as noted by Djelassi et al. [47], ultimately shaping users' intentions to continue engaging with the service. However, it is essential to highlight that while SST substantially enhances satisfaction, it does not exert a direct effect on continuance intention, as evidenced by the insignificant direct impact of SST on continuance intention. This suggests that SST influences long-term user behavior primarily through the degree of satisfaction customers derive from interacting with the technology.

The research outcomes reveal substantial relevance across theoretical and applied domains. From a theoretical perspective, the study demonstrates how user satisfaction functions as a vital mediator, illuminating intricate connections among service quality, SST, and continuance intention. In practical applications, the data indicates that organizations should prioritize enhancing both service quality and SST interactions to boost customer satisfaction, thereby promoting sustained client retention. For service providers, particularly in toll road services, it is essential to ensure a seamless and satisfying user journey from accessing services through SST to experiencing high-quality service. This study underscores that customer satisfaction is not merely a direct outcome of service quality and SST but also a key factor that bridges these elements with continuance intention. To strengthen customer loyalty and encourage long-term

service usage, businesses must uphold high service quality standards while ensuring that SST solutions are intuitive and align with customer expectations. By doing so, they can create positive service experiences that motivate customers to continue using their services over time.

5. Conclusion

The research illuminates key relationships between service quality, SST, customer satisfaction, and continuance intention in the context of Trans-Java toll road operations. The analysis demonstrates that service quality and SST enhance customer satisfaction without directly influencing continuance intention. Instead, customer satisfaction emerges as a crucial mediating factor between these variables. The investigation faced certain constraints, including limited sample size and the exclusion of potential factors like technological trust and user experience that might affect continuance intention. Nevertheless, the research successfully constructs a foundational framework for examining the interplay between service quality, SST, customer satisfaction, and continuance intention.

The research highlights how customer satisfaction functions as a vital intermediary mechanism linking service quality and SST with continuance intention. Through an examination of satisfaction's influence on these connections, specifically in transportation-related self-service technologies, this work enhances current academic understanding. The results reveal fresh insights regarding how service and technological elements jointly affect subsequent consumer actions. The investigation yields valuable implications for organizations managing toll road operations, especially those within the Trans-Java system. The results suggest that improving both service quality and the SST user experience can substantially enhance customer satisfaction. However, ensuring long-term user loyalty necessitates additional strategies to optimize the overall customer experience. Maintaining high service quality standards and ensuring that self-service technologies are user-friendly and seamlessly integrated will be key factors in sustaining customer retention.

Subsequent investigations would benefit from an expanded participant pool and broader regional scope to enhance result applicability. Additionally, researchers should

investigate intervening factors, including technological trust levels and patterns of self-service technology usage, to better understand elements affecting continuance intention. Further exploration of non-technical factors, such as human interaction quality, could also deepen the understanding of customer loyalty drivers.

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