USER SATISFACTION TO CONTINUOUS USAGE ON QRIS PAYMENT: ROLE OF QRIS CONTACTLESS PAYMENT QUALITY

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Abstract

This research aims to develop and evaluate an empirical model of the role of QRIS (Quick Response Code Indonesian Standard) Contactless Payment Quality, including Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Service Security (SS), in shaping User Satisfaction (US) and Continuous Usage (CU) among QRIS payment users in Central Java. The empirical model is built based on the Technology Acceptance Model (TAM) and existing literature on Contactless Payment Quality. For this purpose, an online survey was conducted with approximately 232 QRIS payment users aged 17 and above, and the data were analyzed using the Structural Equation Modeling (SEM) approach with the SmartPLS program. The study found that PEOU significantly influences PU. Additionally, the three components of Contactless Payment Quality (PEOU, PU, and SS) jointly determine US, and both US and SS together impact CU. Furthermore, this research demonstrates that US truly mediates the relationship between PEOU, PU, and SS with CU. Therefore, the findings contribute to the development of a holistic TAM and Contactless Payment Quality framework by providing a comprehensive model of antecedents and consequences of user satisfaction for QRIS payment users. The study also offers valuable insights for managers of companies managing QRIS systems.

Keywords: Perceived Ease of Use; Perceived Usefulness; Service Security; Usage Satisfaction; Continuous Usage

JEL Classification: D16, D91, M31

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INTRODUCTION

Digital technology has permeated every aspect of human life. Technological innovations in various fields, such as transportation services, food delivery, hotel reservations, ticket purchases, and even home cleaning services, have become integral parts of our lives. The rapid development in the technology industry has encouraged people to become more familiar with digital financial transactions. The advantages of digital payments lie in their security, efficiency, user-friendliness, accuracy, and reliability (Yang et al., 2004). In the study conducted by VISA on Consumer Payment Attitudes Study in 2022, it was found estimated that 70% of Southeast Asians prefer using digital payments (cashless payment) over cash. In Indonesia, there are various options for digital payments, including e-wallets, debit cards, credit cards, Virtual Accounts (VA), e-money, payment gateways, and QR codes (Quick Response codes) (VISA, 2022).

The Indonesian government supports the use of QR codes as one of the non-cash payment methods implemented through the National Non-Cash Movement (Gerakan Nasional Non-Tunai, GNNT) program, which was introduced in 2014 by Bank Indonesia. In Indonesia, there are already many digital wallets that utilize QR code technology, such as OVO, GoPay, LinkAja, and DANA. Additionally, nearly all conventional and digital banks have incorporated QR code payment features into their mobile banking applications. On January 1, 2020, Bank Indonesia instructed all payment system service providers to merge their issued QR codes into a standardized QR code known as QRIS (Quick Response Code Indonesia Standard). The positive aspect of QR code standardization lies in its ability to provide transaction data useful for oversight and policy-making. QRIS is expected to facilitate the integration of digital financial economy on a national scale, as it aligns with the National Payment Gateway (*Gerbang Pembayaran Nasional*, GPN) initiative (Hidranto, 2021). By adopting QRIS, Indonesia aims to enhance the efficiency and security of digital transactions, ultimately contributing to the growth of the digital financial ecosystem.

Warjiyo (2023), The Governor of Bank Indonesia has reported that the value of electronic money (e-money) transactions grew by 36.0% (YOY) in 2022, reaching Rp399.6 trillion. Projections for 2023 indicate further growth of 23.9%, with transactions expected to reach Rp495.2 trillion. Similarly, digital banking transactions in 2022 increased by 28.72% (YOY), totaling Rp52,545.8 trillion, and are projected to grow by 22.13% in 2023, reaching Rp64,175.1 trillion. The rapid digitization of payment systems has also fueled the growth of e-commerce transactions, expanding by 18.7% to Rp476 trillion in 2022. For 2023, this is projected to further increase by 11.8%, reaching Rp533 trillion. Analyzing the data, we can conclude that the use of QRIS as one of the cashless payment channels has consistently increased each year from 2020 to 2022. However, as of 2023, QRIS adoption in Indonesia stands at only 18.88% of the total digital payment users. According to data from a study by Venture (2024), the most widely used digital payment method in Indonesia is E-wallet, accounting for 81% of users. It is followed by virtual accounts at 60%, bank transfers at 55%, and pay-later services at 32%. QRIS usage ranks fifth at 31%.In recent years, the number of QRIS users in Indonesia has been steadily increasing. As of June 2023, there are 37 million QRIS users, although it has not yet become the preferred digital payment method in the country. The ongoing growth and adoption of QRIS reflect Indonesia's transition toward a more efficient and secure digital payment ecosystem.

In the context of Central Java, Rahmat Dwi Saputra, who serves as the Head of the Bank Indonesia Representative Office, reported that there are 3.82 million QRIS

users in Central Java. This number increased by 776,900 users from January to April 2023 (Laeis, 2023). Rahmat also stated that there was a further increase in QRIS users in Central Java in May 2023, reaching 3.97 million users. Central Java ranks fourth in terms of QRIS users, trailing behind West Java, DKI Jakarta, and East Jawa (Hapsari, 2023). In annual report from East Venture, states that in Indonesia, individuals who have not yet adopted the QRIS payment method exhibit a high level of awareness and interest. In other words, the presence of QRIS has the potential to be more widely utilized in the future (Venture, 2024). The level of awareness and interest in using QRIS is quite high, reaching 89% and 80%, respectively. This phenomenon is intriguing and worthy of research, as the findings will be valuable. Investigating customer satisfaction is crucial, as it influences the continuous usage of QRIS by users. Additionally, an individual's perception and personal assessment of service performance significantly impact user satisfaction. In other words, how someone perceives and evaluates the performance of a service shapes their level of satisfaction.

Zhong and Moon (2022), explaining that quality of services for QR-based payments is based on three dimensions of contactless payment quality: Perceived Ease of Use, Perceived Usefulness, and Service Security. A lot of previous research regarding TAM and QRIS discusses ease of use and perceived usefulness. However, not much has been discussed regarding the security and continuous usage of these systems, another limitation are that the sample used is only limited by region (Hasyim et al., 2023; Sefrika, 2023; Shasanti, 2024; Susanti & Reza, 2022). This research focus on user satisfaction and continuous usage based on the influence of security services, perceived ease of use, and perceived usefulness

Customers feel pleased with high-quality payment services, they will experience satisfaction with those services. This indicates that service quality affects customer satisfaction (Zhong & Moon, 2022). Jumaan et al. (2020) mention that satisfying experiences when using information technology can significantly influence users' intentions to continue using a service. When users feel satisfied with their experience using QRIS, they are more likely to have the intention to persistently use that service. In other words, user satisfaction can impact their continuous usage intention for QRIS. This relationship between satisfaction and continuous usage intention is crucial in understanding how service quality affects long-term adoption and loyalty. When users perceive high-quality service, it reinforces their satisfaction, leading to sustained engagement with the system (Mamakou et al., 2024). So, ensuring a positive user experience with QRIS can foster its widespread adoption and usage.

This research aims to extend the Technology Acceptance Model (TAM) in explaining the relationship between Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and continuous usage of adopted technology. Several TAM-based studies have already demonstrated that PEOU and PU positively influence continuous usage. The author conducted an analysis to predict usage behavior patterns of QRIS (Quick Response Indonesia Standard) adoption in Central Java. This study significantly contributes to enhancing understanding and utilization of QRIS for payments, both practically and theoretically. Additionally, it provides deeper insights into the transformation of digital payment services within society, enabling managers to develop more effecttive and efficient business strategies. Furthermore, the research sheds light on comprehensive knowledge regarding the adoption of QRIS payment technology and its impact on the community.

LITERATURE REVIEW

Technology Acceptance Model

This research was developed by adopting Technology Acceptance Model

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(TAM). TAM was introduced by Davis (1989), TAM was introduced to explain the prediction of acceptance and usage of new information technology such as software and information systems within an organization. This model explains that system usage is directly determined by the behavioral intention to use, and this behavioral intention depends on the user's attitude towards system usage and perceived system usefulness (Nasri & Charfeddine, 2012). Attitude and perceived usefulness are also influenced by perceived ease of use. Perceived usefulness is defined as the extent to which an individual believes that using a particular system will enhance their job performance, while perceived ease of use is defined as the extent to which an individual believes that using a particular system will be free from effort (Nasri & Charfeddine, 2012). Perceived usefulness directly influences the intention to use, while perceived ease of use has an indirect effect through perceived usefulness and attitude towards behavioral intention.

Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)

Perceived ease of use and perceived usefulness are constructs that play a crucial role in determining attitudes towards adopted information technology (Paiman & Fauzi, 2023). Perceived ease of use (PEOU) is the level of mental effort required when adopting new technology (Zhong & Moon, 2022). Perceived ease of use (PEOU) is the perception of how easily a user can use a particular system without extra effort. (Kang & Hwang, 2022). If customers believe that the payment system is easy to use and can offer convenience, they are likely to have a more positive attitude towards using the system, and they are likely to feel satisfied with their user experience (Zhong & Moon, 2022).

A system is used when it meets user needs, such as ease of learning, usefulness, user satisfaction, ease of use, and perceived quality (Li et al., 2021). Perceived Usefulness, is the subjective perception of users when using a particular technology to enhance task efficiency (Zhong & Moon, 2022), or the extent of belief that using a particular system can enhance the user's ability to perform tasks (Kang & Hwang, 2022). In this context, individuals are more likely to adopt new technology if they perceive a high potential usefulness. Customers will have confidence in transaction performance if they can shop more efficiently, leading to a greater intention for repeat purchases as they feel satisfied with the service (Zhong & Moon, 2022).

According to Venkatesh and Davis (2000), Perceived Usefulness (PU) is influenced by Perceived Ease of Use (PEOU). This is primarily because consumers or technology users perceive that a system will be more beneficial if it is more convenient for them to use it, and the more useful they perceive a system to be, the better their attitude towards the system. This leads to an increase in system usage (Davis, 1989; Kang & Hwang, 2022). The extent to which it is perceived that using a particular system will require less physical and mental effort is referred to as perceived ease of use. Increasing usefulness can result in less effort and better outcomes with the same amount of work. (Kang & Hwang, 2022). The relationship is highly likely to occur in QRIS payment. Therefore, hypothesis 1 is proposed:

H_1: There is a positive influence of Perceived Ease of Use (PEOU) on Perceived Usefulness (PU) in QRIS payment.

Satisfaction is one of the constructs not discussed in TAM, but this construct is useful for understanding the extent to which PEOU and PU effectiveness in adopting a new technology. This is especially because there is a tendency for the ease and benefits of the technology adopted by a user to make them feel positive and inclined to use the adopted technology (Baker-Eveleth & Stone, 2020). Satisfaction, in relation to systems, is generally manifested through affective

feelings (Wang & Song, 2017). It is highly likely that individuals who are satisfied with a system will be more willing to use it. In the context of QRIS payment, user satisfaction measures how much users believe that a system meets their requirements, as a system with dissatisfied users cannot be considered successful (Baker-Eveleth & Stone, 2020; Wang & Song, 2017). Several studies have also shown that PEOU (Perceived Ease of Use) and PU (Perceived Usefulness) are two constructs that determine user satisfaction with a technology (Abolghasemi et al., 2014; Baker-Eveleth & Stone, 2020; Rawashdeh et al., 2021). Other studies have also shown that PU (Perceived Usefulness) determines user satisfaction with a system (Ghazal et al., 2016; Liaw & Huang, 2013).

The relationship is highly likely to occur in QRIS payment. Therefore, hypotheses 2 and 3 are proposed:

H_2: There is a positive influence of PEOU on user satisfaction with QRIS payment.

H_3: There is a positive influence of PU on user satisfaction with QRIS payment

Service Security

QRIS payment is one of the latest technologies in the mobile payment model. Service security is another construct that has not been explicitly addressed in TAM. Security refers to the company's ability to prevent the theft of clients' personal information and transaction data during online transactions (Zhong & Moon, 2022). A way to protect and ensure, as well as prevent hackers from attacking customer information and privacy (Li et al., 2021). Security in mobile payment is crucial for all users and mobile payment service providers. Payment data must be protected while stored, in transit, and in use. Desired security features in mobile payment systems include authentication, access control, confidentiality, integrity, non-repudiation, and availability (Hwang et al., 2021). Security services are a multidimensional factor encompassing the service itself, platforms, networks, and devices. Services generate new value in mobile payment usage, platforms play a crucial role in the IoT value chain as interfaces connecting services and devices, networks comprise both wired and wireless communications necessary for fintech service usage, and devices are objects equipped with various sensors. (Hwang et al., 2021). Service security is also crucial for enhancing user satisfaction with information system technology (Li et al., 2021). This study assumes that the potential relationship between service security and user satisfaction also applies to the adoption of QRIS payment technology. Therefore, hypothesis 4 is proposed:

H_4: There is a positive influence of service security on user satisfaction with QRIS payment.

Continuous Usage

Satisfaction is depicted as an emotional state acquired by an individual from a product, service, or online environment such as social interactions on various platforms. Continuously increasing satisfaction from technology usage will motivate users to remain willing and committed to engaging in the adopted technology's usage (Sharabati et al., 2022). Satisfaction will determine to what extent someone will continue to use the technology. (Pereira et al., 2015). Furthermore, security is crucial for consumers in deciding whether to use electronic payments. The internet is increasingly utilized in sales, purchases, and payments, leading to various vulnerabilities and security issues emerging and their numbers increasing (Liu et al., 2022). To ensure secure online transaction implementations, it is important for the public to be able to choose reliable electronic payment methods (Hwang et al., 2021). Electronic payment security is part of the information security framework, which also includes data security and information security. Electronic payment security protects electronic transactions from

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unauthorized access, use, alteration, or sabotage (Liu et al., 2022). Many studies emphasize that security demands in electronic payments can increase consumers' intention to continue using electronic payment systems (Kim et al., 2010; Lai & Zainal, 2015). When consumers prioritize the security of electronic transaction information, they will have a strong intention to use secure electronic payments. Therefore, hypotheses 5 and 6 are proposed:

H_5: There is a positive influence of service security on continuous usage of QRIS payment

H_6: There is a positive influence of user satisfaction on continuous usage of QRIS payment

Empirical model in this study can be describe in Figure 1.

RESEARCH METHODS

Population and Sample

The population in this study consists of QRIS users in Central Java. Given that the exact number of QRIS users in Central Java has not been definitively determined, the researchers aimed to use as large a sample as possible to statistically represent the population. According to Hair et al. (2019), a minimum sample size for models with five or fewer constructs, where each construct has more than three items (observed variables), and high item communalities (0.6 or higher), requires a minimum sample size of 100. According to Kyriazos (2018) the minimum sample size in N absolute is 200, which offers adequate statistical power for data analysis. The researchers employed non-probability sampling using convenience sampling. Data were collected through an online survey among QRIS users in Central Java using Google Forms. The sample size of 232 responses is determined to be representative and fulfills the criteria as desired by SEM SmartPLS, as recommended Hair et al. (2019) and Kyriazos (2018). The survey targeted QRIS payment customers aged 17 years and older. At this age, they are generally accustomed to using QRIS as a transaction tool for shared consumption activities. 232 responses met the expected criteria (Table 1). The majority of respondents were women (67%), aged 17 to 25 years (85%), with education levels ranging from high school to bachelor's degree (92%), earning a monthly salary of less than Rp 1,500,000 (50%), and utilizing banking platforms (73%).

Data Analysis Techniques

The data analysis is conducted using the Partial Least Squares (PLS) method, specifically the Structural Equation Modeling (SEM) approach, with the SmartPLS software. Typically, PLS analysis comprises two sub-models: the measurement model (also known as the outer model) and the structural model (often referred to as the inner model) (Hair et al., 2019). Confirmatory factor analysis is used to determine the validity and reliability of the constructs employed. According to Henseler et al. (2014), mentioned the heterotrait-monotrait (HTMT), they suggest a threshold value of below 0.90, indicates that each construct demonstrates discriminant validity. Testing reliability, validity, and model goodness of fit is conducted comprehensively based on recommendations (Arbuckle, 2014; Hair et al., 2019). An instrument is considered valid if all loading factors exceed 0.6, and the p-value is less than 0.01, and the discriminant validity value of each construct exceeds the correlation between constructs. A construct is considered reliable if the average variance extracted (AVE) value exceeds 0.5; Cronbach's alpha (CA) exceeds 0.6; and the construct reliability (CR) value exceeds 0.7 overall. A model is said to have a good fit if it yields an SRMR of less than 0.10 (Hair et al., 2019), According to Henseler et al. (2016), mentioned that d_UL and d_G to have a good fit should be less than 0.95 and Chi-Square .

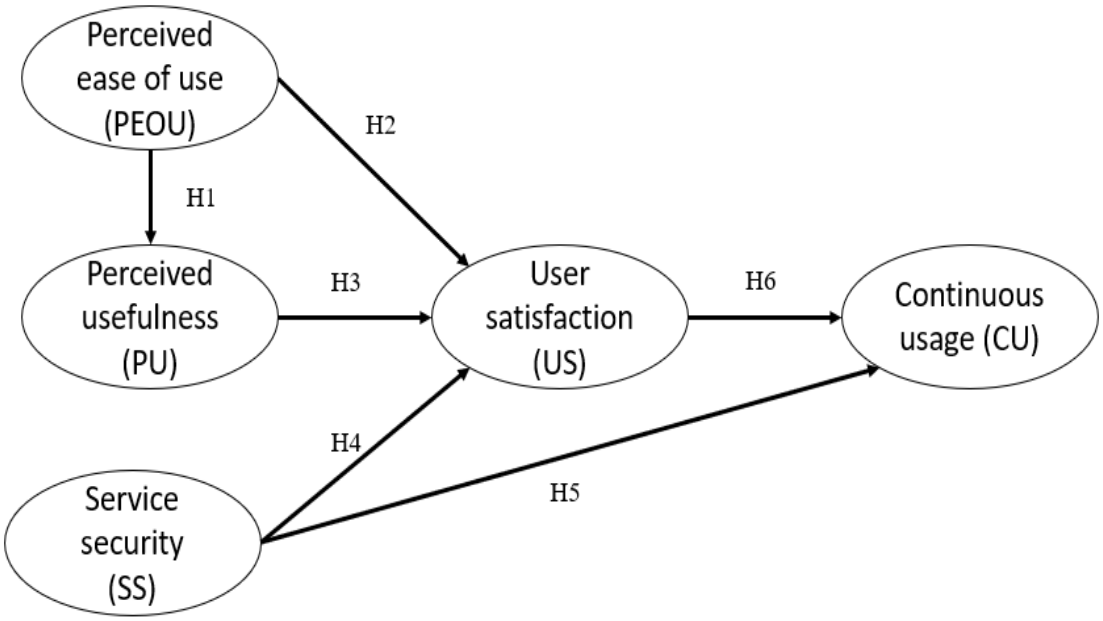

Figure 1. Empirical Research Framework

Table 1. Demographic Respondent

Items	Classification	Frequency	Percentage
Samples	Number of sample	232	100
Gender	Men	77	33
	Women	155	67
Age	17 – 25 years old	198	85
	26 – 35 years old	24	10
	36 – 45 years old	6	3
	> 46 years old	4	2
Education	Senior High School	104	45
	Diploma / Bachelor	108	47
	Master Degree	15	6
	Doctor	5	2
Wages	IDR 500.000 – IDR 1.500.000	117	50
	IDR 1.500.000 – IDR 2.500.000	33	14
	IDR 2.500.000 – IDR 5.000.000	57	25
	Above IDR 5.000.000	25	11
Platform	Bank	169	73
	E-Wallet (ShopeePay, GoPay,OVO,etc)	63	27

Source: processed data, 2024

Measurement

This study involves five interrelated constructs and several measurement items developed from previous research. Perceived Ease of Use (PEOU) utilizes five measurement items, while Perceived Usefulness (PU) employs six measurement items. Both were adapted from (Davis, 1989; Zhong & Moon, 2022). The construct of service security is measured using four items, which were adapted Chiu et al. (2005). User satisfaction is measured using 5 items, which have been adapted from Salisbury et al. (2001), The concept of continuous usage is assessed using 4 adapted measurement items from Zheng et al. (2013); Zhong and Moon (2020). In addition, a 5-point agree-disagree scale is

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used to assess the quality of measurement items, ranging from 1 (strongly disagree) to 5 (strongly agree). All measurement items and their results are summarized in Table 2.

RESULT AND DISCUSSION

Validity, Reliability and Goodness of Fit Model

The results of the confirmatory factor analysis and goodness of fit model indicate that the empirical model is supported by construct validity, reliability, and good fit. The reasons are: (1) all loading factors of the selected items as listed in the Table 2 are significant and have values greater than 0.6; (2) the variance extracted (AVE) values of each latent construct PEOU, PU, SC, US, and CU all exceed 0.5 (Table 4); (3) All Cronbach's alpha (CA) values are greater than 0.6; (4) construct reliability (CR) values are all greater than 0.7, as shown in Table 4 (Hair et al., 2019); and (5) the discriminant validity values of each construct exceed the correlations between constructs (Table 5); (6) HTMT values for all constructs are below 0.90. This suggests that the measurement model is considered acceptable and can advance to structural analysis (Table 6); and (7) the goodness of fit statistics of the measurement model indicate an acceptable fit, with SRMR (0,060) less than 0.10, D_ULS (1.062), d_G (0.587) and the result of Chi-square is 760.848, the NFI ranges between 0 and 1, and a model with perfect fit would produce an NFI of 1 the result is 0.809 (see Table 3). .

Table 2. Construct and Outer Loadings

Items	Content	Loading
PEOU1	Using QRIS payment technology is very easy for me	0.809**)
PEOU2	Using QRIS payment technology is understandable and clear to me.	0.854**)
PEOU3	It won't be difficult for me to become proficient in using QRIS payment technology.	0.814**)
PEOU4	Using QRIS payment technology saves me time and effort.	0.814**)
PEOU5	It is very easy for me to interact with QRIS payment technology.	0.764**)
PU1	Using QRIS payment technology allows me to pay more quickly.	0.740**)
PU2	Using QRIS payment technology makes it easier for me to conduct transactions.	0.835**)
PU3	Using QRIS payment technology will benefit me.	0.794**)
PU4	QRIS payment technology is a relatively efficient payment method.	0.781**)
PU5	Using QRIS payment technology will help me make payments smoothly.	0.776**)
PU6	Using QRIS payment technology is beneficial for me.	0.788**)
SS1	It is relatively safe to provide transaction information during payment using QRIS payment technology.	0.824**)
SS2	I don't see any security issues in offering personal information during payment using QRIS payment technology.	0.819**)
SS3	The risks associated with using QRIS payment technology are relatively low.	0.825**)
SS4	Overall, using QRIS payment technology for payment is safe in my opinion.	0.892**)
US1	Using QRIS payment technology for payment is a good idea.	0.773**)
US2	I enjoy making purchases with QRIS payment technology.	0.803**)
US3	I am satisfied with using QRIS payment technology.	0.850**)
US4	QRIS payment services meet my expectations.	0.841**)
US5	The overall purchasing experience using QRIS payment technology is satisfying.	0.837**)
CU1	I plan to use QRIS payment technology for purchases in the coming months.	0.847**)
CU2	I will continue to use QRIS payment technology to make purchases.	0.887**)
CU3	I prefer to continue using QRIS payment technology over other methods.	0.894**)
CU4	Overall, I want to continue using QRIS payment technology.	0.897**)

Source: adopted from Zhong and Moon (2022)

Notes: ***) p-value < 0,01; PEOU = Perceived Ease of Use; PU = Perceived Usefulness; SS = Service Security; US = User Satisfaction; CU = Continuous Usage

Table 3. Model Fit

	Saturated Model	Estimated Model
SRMR	0.060	0.072
d_ULS	1.062	1.534
d_G	0.587	0.603
Chi-Square	760.848	748.038
NFI	0.809	0.812

Source: processed data, 2024

Table 4. Validity and Reliability

Variables	α	rho_A	CR	AVE
Perceived Ease of Use	0.870	0.871	0.906	0.658
Perceived Usefulness	0.876	0.878	0.907	0.618
Service Security	0.862	0.873	0.906	0.706
User Satisfaction	0.879	0.879	0.912	0.675
Continuous Usage	0.904	0.904	0.933	0.777

Source: processed data, 2024
Notes: α = Cronbach alpha; CR = Composite Reliability; AVE = Average Variance Extracted

Table 5. Discriminant Validity Fornell-Lacker

Variables	CU	PEOU	PU	SA	SS
Continuous Usage (CU)	**0.882**[a)]				
Perceived Ease of Use (PEOU)	0.496[b)]	**0.811**			
Perceived Usefulness (PU)	0.591	0.781	**0.786**		
Service Security (SS)	0.656	0.677	0.780	**0.841**	
User Satisfaction (US)	0.510	0.429	0.487	0.586	**0.840**

Source: processed data, 2024
*Notes: PEOU = Perceived Ease of Use; PU = Perceived Usefulness; SS = Service Security; US = User Satisfaction; CU = Continuous Usage; [a)] Discriminant Validity are bold diagonal, [b)] the correlation between construct.

Table 6. Discriminant Validity HTMT

	CU	PEOU	PU	SS	US
Continuous Usage (CU)					
Perceived Ease of Use (PEOU)	0.557				
Perceived Usefulness (PU)	0.663	0.889			
Service Security (SS)	0.570	0.486	0.554		
User Satisfaction (US)	0.734	0.773	0.889	0.665	

Source: processed data, 2024

Hypothesis Testing and Structural Model Results

Hypothesis testing using Structural Equation Modeling (SEM) with SmartPLS version 3. PLS-SEM can produces good results with non-normal data, PLS-SEM works well with both reflective and formative measurement models (Hair et al., 2019). The results of the hypothesis test in Table 7 conducted revealed that Perceived Ease of Use positively influences Perceived Usefulness (β = 0.781, p-value < 0.05), thus H1 is accepted. Other results indicate that User Satisfaction is indeed influenced by Perceived Ease of Use (β = 0.141, p-value < 0.05), Perceived Usefulness (β = 0.544, p-value < 0.05), and Security Service (β = 0.259, p-value <

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0.05). This indicates that H_2, H_3, and H_4 are accepted. Additionally, Continuous Usage in QRIS users is directly dependent on User Satisfaction (β = 0.543, p-value < 0.05) and Security Service (β = 0.193, p-value < 0.01). Therefore, hypotheses H_5 and H_6 are accepted (See Figure 2).

Specifically for indirect path analysis, we request assistance with the Sobel test in generating p-values. The Sobel test is used to calculate estimates of the indirect effect of the independent variable on the dependent variable through the mediator (Sobel, 1982). This analysis involves partial mediation and full mediation. Partial mediation occurs when there is a direct relationship between the independent variable and the dependent variable, in addition to an indirect relationship through the mediating variable. Partial mediation also occurs because the indirect effect has the same sign as the total effect (Rucker et al., 2011). Full mediation occurs when there is no direct relationship between the independent variable and the dependent variable, while the indirect relationship through the mediating variable is significant. (Jogaratnam, 2017; Rucker et al., 2011). The indirect path coefficient from PEOU to CU through US at Table 8 is determined by multiplying the path coefficient from PEOU to US (β = 0.141) by the path coefficient from US to CU (β = 0.543), resulting in β = 0.076. The Sobel test results show a t statistic of 2.064 and a p-value of 0.040, indicating that User Satisfaction acts as a partial mediator in the relationship between PEOU and CU.

Next, the indirect path coefficient from PU to CU through US is determined by multiplying the path coefficient from PU to US (β = 0.544) by the path coefficient from US to CU (β = 0.543), yielding β = 0.295. The Sobel test results show a t statistic of 6.172 with a p-value of 0.000, indicating that US plays an important mediating role in the relationship between PU and CU. Meanwhile, the indirect path coefficient from SS to CU through US is determined by multiplying the path coefficient from SS to US (β = 0.259) by the path coefficient from US to CU (β = 0.543), resulting in β = 0.141. The Sobel test results show a t statistic of 4.329 with a p-value of 0.000, indicating that CU serves as a partial mediator in the relationship between SS and CU. Additionally, there is also an indirect path coefficient from PEOU to CU through PU and US as mediators. This is determined by multiplying the path coefficient from PEOU to PU (β = 0.781) by the path coefficient from PU to US (β = 0.544), and the path coefficient from US to CU (β = 0.543), resulting in β = 0.231. The Sobel test results show a t statistic of 5.833 with a p-value of 0.000, indicating that CU and US indeed act as important mediators in the relationship between PEOU and US.

The purpose of this study is to develop and test a holistic model that explains the formation of User Satisfaction and Continuous Usage among QRIS users in Central Java. This model is constructed through theoretical review and various literature, such as the Technology Acceptance Model (TAM), contactless payment quality, and literature on user behavior. Our model directly examines the relationship between several components of contactless payment quality in QRIS payment system usage, namely Perceived Ease of Use, Perceived Usefulness, and Service Security, and their direct relationships with User Satisfaction; the direct relationships of User Satisfaction and Service Security with Continuous Usage; the indirect relationship of PEOU to CU through PU and US as mediators; and the indirect relationships between PEOU, PU, and SS to CU through US. Empirical data analysis has confirmed most of the hypothesized relationships. Ten hypotheses were established, and the test results show that seven hypotheses are accepted, namely H_1, H_2, H_3, H_4, H_5, dan H_6. Here are the findings of our study: *First*, User Satisfaction (US) is a significant driver of Continuous Usage (CU).

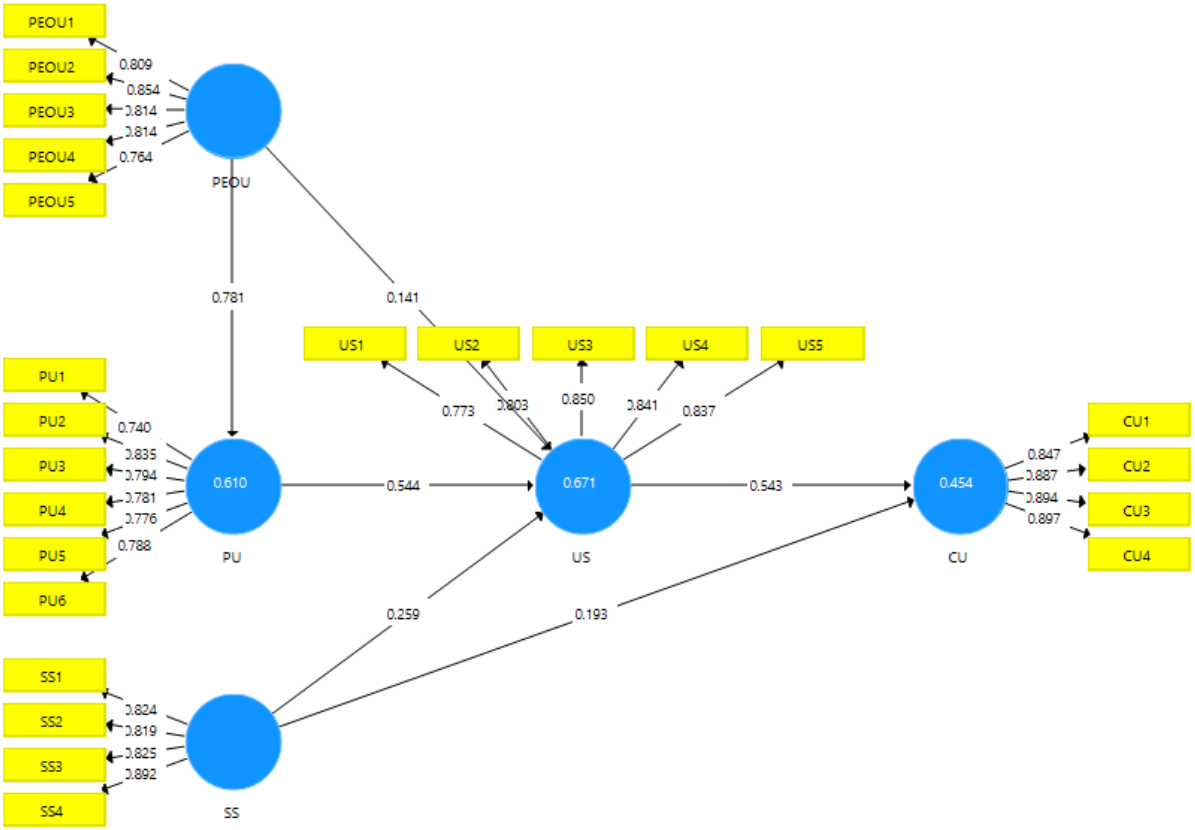

Figure 2. Structural Model Result
Source: processed data, 2024

Table 7. Result of Hypothesis Testing

Hypothesis	Direct Effect	Coefficient	T Statistics	P Values	Conclusion
H_1	PEOU → PU	0.781	28.922	0.000	Supported
H_2	PEOU → US	0.141	2.145	0.032	Supported
H_3	PU → US	0.544	8.391	0.000	Supported
H_4	SS → CU	0.193	3.416	0.001	Supported
H_5	SS → US	0.259	4.707	0.000	Supported
H_6	US → CU	0.543	9.024	0.000	Supported

Source: processed data, 2024

Table 8. Indirect Effect Hypothesis Testing

Indirect Effect	Coefficient	T Statistics	P Values	Conclusion
PEOU → US → CU	0.076	2.064	0.040	Supported
PU → US → CU	0.295	6.172	0.000	Supported
PEOU → PU → US → CU	0.231	5.833	0.000	Supported
SS → US → CU	0.141	4.329	0.000	Supported
PEOU → PU → US	0.425	7.816	0.000	Supported

Source: processed data, 2024

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This study indicates that QRIS users' satisfaction while using the QRIS payment system will directly increase their continuous usage (CU). This finding is consistent with previous research. (Pereira et al., 2015; Sharabati et al., 2022). User satisfaction while using the QRIS payment system has an influence on the reusage process of the QRIS payment system. This high level of satisfaction will induce positive behavior in users to reuse the QRIS payment system.

Second, Perceived Usefulness (PU) is a significant driver of the formation of User Satisfaction (US). This complements findings from research that link Perceived Usefulness with User Satisfaction. (Abolghasemi et al., 2014; Baker-Eveleth & Stone, 2020; Rawashdeh et al., 2021). Perceived Usefulness (PU) involves the process where QRIS users perceive benefits when using the QRIS payment system. Meanwhile, User Satisfaction refers to the satisfaction gained by users when conducting transactions using the QRIS payment system. PU is a crucial driver of Continuous Usage (CU) indirectly through the mediating variable US. Perceived Usefulness becomes a concern for users when they consider reusing the QRIS payment system. The benefits obtained by users when using the QRIS payment system shape a positive perspective for users in forming CU when they are satisfied with the system they have used.. This is consistent with previous research. Zhong and Moon (2022) which states that customers will have confidence in transaction performance if they can shop more efficiently, resulting in a greater intention for repeat purchases because they are satisfied with the service. This suggests that PU is an important variable in forming US, and subsequently, when users experience satisfaction in using their QRIS system, they will repeatedly use the system (Sharabati et al., 2022).

Third, Perceived Ease of Use (PEOU) has a positive influence on Perceived Usefulness (PU) among QRIS users. This complements previous research findings linking Perceived Ease of Use to Perceived Usefulness. (Nasri & Charfeddine, 2012; Venkatesh & Davis, 2000). Technology users perceive a system to be more useful if it is increasingly convenient for them to use. Moreover, the more they perceive a system to be beneficial, the better their attitude towards the system. This leads to an increase in system usage (Kang & Hwang, 2022).

Additionally, Service Security (SS) has a positive influence on Continuous Usage, both directly and indirectly. In the indirect relationship, SS is mediated by US. This study found that SS has a positive influence on US. This is consistent with previous literature suggesting that higher levels of security service provided lead to higher user satisfaction. (Li et al., 2021; Zhong & Moon, 2022). In the direct relationship between SS and CU, it was found that SS has a significant positive influence on CU. Electronic payment security is part of the information security framework, which also includes data security and information security. Electronic payment security protects electronic transactions from unauthorized access, use, alteration, or sabotage (Liu et al., 2022). This study contributes to the existing literature by emphasizing the importance of security when using electronic payments (Kim et al., 2010; Lai & Zainal, 2015). Users will reuse a technology when they perceive the security provided by that technology.

CONCLUSION AND RECOMENDATION

Firstly, our findings provide a new perspective for existing research on QRIS payment systems related to user behavior in reusing the QRIS system. Understanding how to enhance continuous usage in a technologically advanced world based on customer engagement, perceived usefulness, perceived ease of use, security, and satisfaction is crucial. Our findings enrich the Technology Acceptance Model (TAM)

by positioning perceived usefulness (PU) and perceived ease of use (PEOU) as important drivers of satisfaction (US). Interestingly, when PU becomes a significant driver of US, and US becomes a significant driver of continuous usage (CU). Thus, PEOU and PU will influence US and also indirectly affect the formation of continuous usage (CU). Both factors are capable of enhancing consumer interest in contributing to satisfaction formation. These findings are intriguing for advancing theoretical knowledge in post-adoption behavior literature. *Secondly*, the findings contribute to service quality literature by demonstrating the involvement of security (SS) in the context of QRIS payment systems. The direct and significant positive influence of SS on US and indirectly on CU has been documented in the marketing literature on post-adoption technology user behavior.

Involving customers in product marketing through QRIS is inevitable for companies today. The results of the research show that user satisfaction has a significant impact on the continuous usage of QRIS payment systems. Therefore, both government regulators and managers in companies involved in QRIS implementation and development must actively consider input and feedback from users and strive to ensure that the user experience is continually enhanced. To support broader and sustainable adoption of QRIS payments, investments in adequate technological infrastructure development and system security are necessary to guarantee user data protection and transaction security. Executives need to consider these aspects when designing and managing QRIS payment systems. The importance of cooperation among various stakeholders, including government, financial technology companies, banks, merchants, and consumers, is crucial in promoting the adoption and sustainable use of QRIS payment systems.

In terms of security, security measures are needed to minimize the risks of information leakage and fraud. Managers also need to ensure that information about QRIS security services is clearly communicated to users. This may include information about security measures to be implemented, security certifications, and actions users should take to protect their personal information. Additionally, managers need to identify factors that can drive the sustainable use of QRIS, such as user satisfaction, perceived benefits, and ease of use. They can design user retention strategies and incentives to ensure that users continue to use QRIS as their primary payment method.

In general, our research has limitations. Firstly, we focused only on QRIS users in Central Java, which limits the generalizability of the results globally. Although it is essential for researchers to understand post-technology usage behavior in specific countries (such as Indonesia) with particular cultural characteristics, focusing solely on them only provides a partial picture of the overall landscape of contactless payment, including QRIS. It is important to note that data from QRIS user segments in other cities with different cultural characteristics may offer more diverse results. Thus, studies offering broader perspectives on the global QRIS phenomenon from an international, cross-cultural, and global perspective are still needed. We have successfully ensured that Perceived Usefulness (PU) acts as an effective driver in forming User Satisfaction (US) and subsequently ensuring Continuous Usage (CU) as expected by the theoretical framework.

We encourage researchers to further investigate the roles of PU, PEOU, and SS in other contactless payment contexts. For example, since we revealed that SS directly impacts US and CU, while PEOU and PU only indirectly affect CU, more research is needed to test the importance of these relationships generally and in the context of global consumers in contactless payment contexts like QRIS. Specifically, the roles of PEOU and PU require further

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investigation. This study has not proven a direct relationship with CU. We call for further research to close this gap, along with new ideas to explore the roles of PEOU and PU for other post-adoption behaviors such as word-of-mouth and habitual usage.

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