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How the Integration of Payment Systems Through QRIS Accelerates Economic and Financial Cooperation in the ASEAN Region

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ABSTRACT

This study aims to analyze the opportunities, challenges, strengths, and weaknesses of payment systems, as well as the strategies for implementing regional payment connectivity through QRIS as an alternative for integrating payment systems in the ASEAN region. The research employs an exploratory mixed-methods approach, utilizing SWOT analysis and linear regression. Data sources include secondary data, in-depth interviews, and focus group discussions with 85 respondents from Bank Indonesia, local governments, academics, ASEAN tourists, and MSME actors across Batam, Yogyakarta, and West Nusa Tenggara. The findings indicate that QRIS has a positive impact on the economies of ASEAN countries. As part of the ASEAN financial system, QRIS demonstrates strong characteristics due to its well-balanced strengths and weaknesses in trade transactions. As a result, opportunities and threats have become the government's focus in enhancing trade interactions across the region. Furthermore, QRIS serves as a viable alternative for integrating payment systems in ASEAN, particularly in the trade, MSME, and tourism sectors. To maximize its potential, policymakers should enhance cross-border regulatory frameworks, promote financial literacy among MSMEs, and strengthen digital infrastructure to support seamless transactions across ASEAN countries.

1. INTRODUCTION

Economic cooperation within the Association of Southeast Asian Nations (ASEAN) region is crucial in driving economic growth, stability, and integration among its member states. Established in 1967, ASEAN aims to enhance economic collaboration through various initiatives, such as the ASEAN Economic Community (AEC), which seeks to create a single market and production base. This integration is essential for promoting trade, investment, and economic resilience among the ten member countries, which collectively represent a significant economic bloc with a population exceeding 600 million and a combined GDP of approximately $2 trillion [1].

The adoption of the ASEAN Strategic Action Plan for SME Development (2016-2025) exemplifies the member states' commitment to supporting micro, small, and medium enterprises (MSMEs), which play a vital role in economic diversification and job creation [2]. Furthermore, the interconnectedness fostered by economic cooperation enhances the region's global competitiveness, enabling ASEAN countries to better navigate the complexities of international trade and investment [3].

Economic cooperation in ASEAN is not only focused on enhancing trade but also on addressing broader socio-economic challenges and promoting sustainable development. The ASEAN region faces various issues, including disparities in economic performance (see Figure 1), necessitating a comprehensive integration effort encompassing trade, capital flows, and labor mobility [4].

Therefore, the ASEAN framework encourages member states to collaborate on policies that reduce trade and investment barriers, fostering a more cohesive economic environment [5]. Additionally, the emphasis on regional integration supports infrastructure development and connectivity, facilitating the smoother flow of goods and services across borders [6]. As ASEAN continues to evolve, economic cooperation remains crucial in ensuring that member states can collectively respond to global economic shifts and challenges, ultimately creating a more resilient and prosperous region [7].

ASEAN countries exhibit varying economic growth rates. In 2024, some countries, such as Indonesia, the Philippines, and Vietnam, recorded an average economic growth rate above 5%. However, others, like Myanmar and Cambodia, experienced growth below 5% [8]. This disparity presents a unique challenge for ASEAN. The evolution of technology in

the financial sector, particularly the emergence of financial technology (fintech) payment systems, is expected to serve as a catalyst for economic integration, aligning with ASEAN's founding objectives. This integration could contribute to sustainable economic growth across its member states.

Fintech has facilitated the development of various digital payment solutions, including mobile wallets, QR code payments, cryptocurrencies, and others that have transformed traditional payment paradigms [9]. Additionally, digital payments offer convenience, speed, and security [10]. It is therefore unsurprising that the demand for payment systems has surged alongside the exponential growth of e-commerce, driving financial institutions and new market entrants to innovate and adapt their offerings [11]. This shift toward a cashless economy not only streamlines transactions but also enhances financial inclusion by providing access to payment services for previously unbanked populations.

Additionally, the COVID-19 pandemic has served as a catalyst for the rapid adoption of digital payment systems, as both consumers and businesses sought contactless solutions to minimize physical interactions [12]. The integration of technologies such as blockchain and artificial intelligence into payment systems has further revolutionized transactions, enabling features like real-time processing and personalized payment recommendations [13]. The expansion of digital payment systems is expected to play a crucial role in shaping the future of commerce, driving economic growth, and fostering a more inclusive financial ecosystem [14]. ASEAN countries have demonstrated increasing digital adoption capabilities, making it feasible to integrate financial systems to enhance economic growth among member states (see Figure 2).

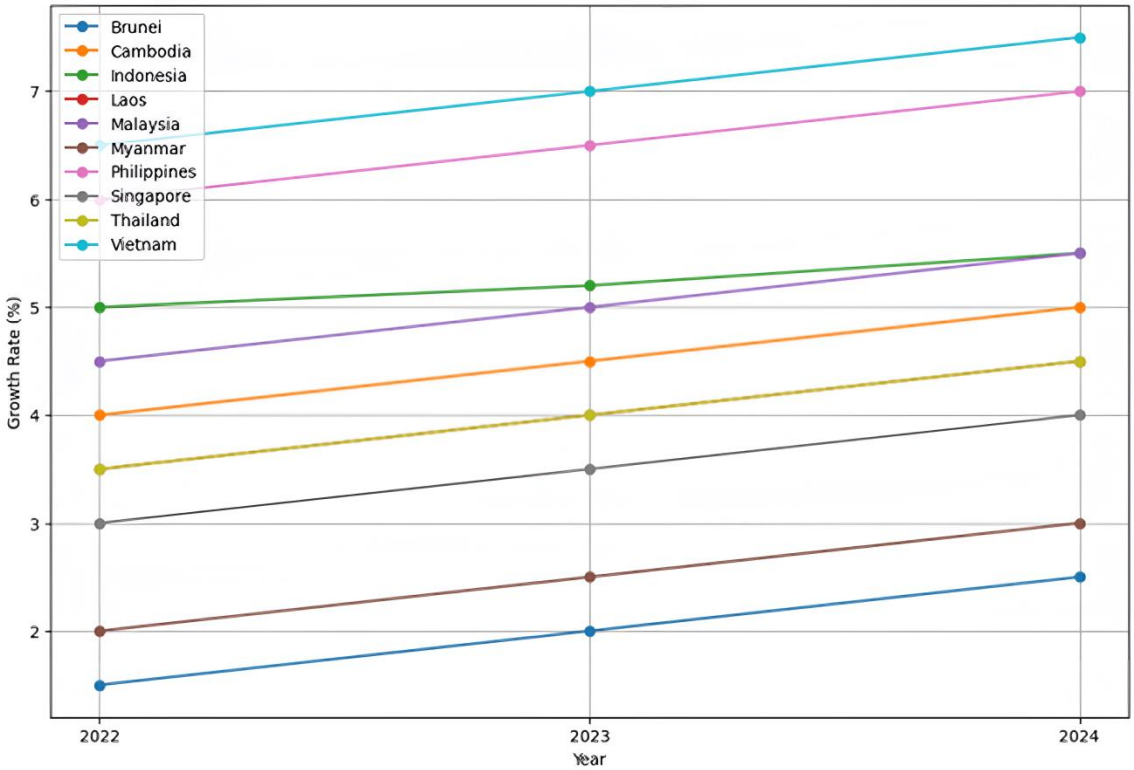


Figure 1. Economic growth of ASEAN countries (2022-2024) [8]

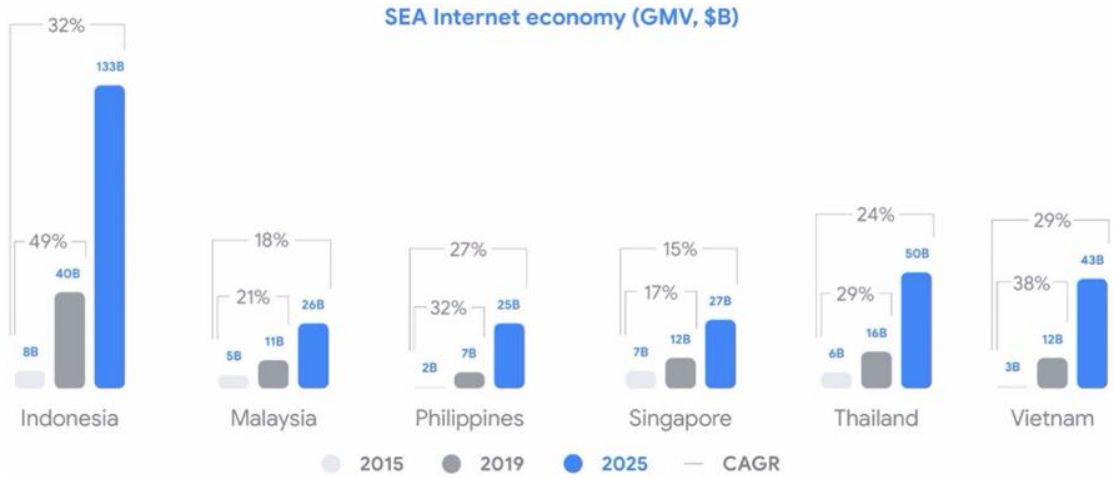


Figure 2. SEA internet economy [15]

In ASEAN countries like Indonesia, the introduction of standardized payment systems, such as the Quick Response Code Indonesian Standard (QRIS), has facilitated seamless transactions across various platforms, enhancing the user experience and promoting interoperability among different payment services [10]. QRIS is a significant innovation in Indonesia's payment system landscape, launched by Bank Indonesia (BI) in January 2020. This standardized payment system integrates various QR-based payment applications, allowing consumers and merchants to conduct transactions smoothly across different platforms without the need for multiple QR codes [16].

QRIS aims to enhance the efficiency of digital payments by providing a unified framework that simplifies the payment process for users and businesses, thus promoting a cashless economy [17]. Its implementation is particularly important for MSMEs, as it facilitates easier access through digital payments, which can drive economic growth and improve financial inclusion [18], while significantly influencing adoption among consumers and businesses [19]. QRIS is expected to play a crucial role in the digital transformation of the payment landscape not only in Indonesia but also as a leader in digital payment solutions across the ASEAN region [20].

However, the implementation of QRIS in ASEAN countries still faces challenges related to interoperability among various payment systems, due to limitations in infrastructure, capacity, and differing regulations among member states. Interoperability is essential for promoting cross-border transactions. Additionally, the digital literacy gap and access to technology hinder its effectiveness in fostering economic cooperation. Integrating QRIS into the broader framework of the AEC is crucial, as it aligns with the goal of enhancing the free flow of goods, services, and capital [21].

QRIS is expected to play a crucial role in the digital transformation of the payment landscape not only in Indonesia but also as a leader in digital payment solutions across the ASEAN region [22]. However, the implementation of QRIS in ASEAN countries still faces challenges related to interoperability among various payment systems, due to limitations in infrastructure, capacity, and differing regulations among member states [23]. Interoperability is essential for promoting cross-border transactions. Additionally, the digital literacy gap and access to technology hinder its effectiveness in fostering economic cooperation. Integrating QRIS into the broader framework of the AEC is crucial, as it aligns with the goal of enhancing the free flow of goods, services, and capital [24].

To fully realize the potential of QRIS in supporting ASEAN's digital payment integration, further research is needed to explore its opportunities and challenges. However, existing studies have yet to comprehensively examine the opportunities, challenges, strengths, and weaknesses of payment systems, as well as the strategic role of QRIS in facilitating ASEAN integration. Therefore, this study aims to: (1) analyze the opportunities, challenges, strengths, and weaknesses of regional payment connectivity (RPC) through QRIS as an alternative for payment system integration in the ASEAN region, and (2) formulate an implementation strategy for RPC through QRIS to enhance payment system integration within ASEAN.

2. LITERATURE REVIEW

Global research on financial transactions using QRIS has shown a significant increase in adoption and usage, particularly since the onset of the COVID-19 pandemic. QRIS has become a crucial tool in facilitating digital financial transactions in Indonesia. However, existing studies primarily focus on technology adoption, financial literacy, and consumer behavior. For example, Patrisia [25] highlighted the increasing trend of QRIS transactions since the beginning of the pandemic and its connection to financial literacy and consumer behavior. This study also examined how financial literacy and financial self-efficacy influence impulsive buying behavior through the use of electronic wallets.

Similarly, previous studies explored the impact of electronic wallet usage and financial literacy on impulsive buying behavior [26-28], which is particularly relevant in the context of QRIS transactions. Additionally, research on the development of financial technology and its impact on financial management behavior in society has been conducted. QRIS, as part of fintech in Indonesia, was also discussed in this context by previous studies [29-31]. Overall, while research on QRIS has been conducted, it has predominantly focused on technology adoption, financial literacy, and consumer behavior.

The role of QRIS is evident in its function as a bridge for various economic activities, including trade (exports and imports), which is reflected in the trade balance performance. These transactions tend to fluctuate significantly based on macroeconomic conditions. The strong connection between macroeconomic factors and QRIS transactions is influenced by exchange rate volatility, which impacts the recorded trade balance values. Consequently, the integration of QRIS as a payment system is illustrated as shown in Figure 3.

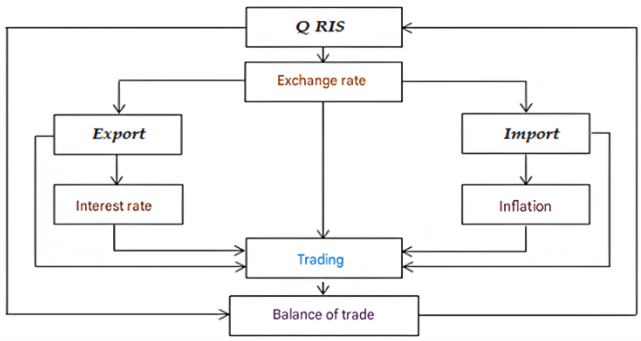


Figure 3. Thought flow of payment system integration

3. METHODOLOGY

This study employs an exploratory mixed-method approach, combining qualitative analysis reinforced by quantitative data. The data used includes secondary data from BI's Financial Reports from 2005 to 2023 and primary data obtained through in-depth interviews and/or focus group discussions (FGD) with 85 respondents. These respondents include representatives from BI, business actors, MSMEs, tourists in tourist areas, central government regulators, and local government officials. The study was conducted in Batam, West Nusa Tenggara, and Yogyakarta.

For the analysis, the study utilizes a linear regression model and a SWOT (strengths, weaknesses, opportunities, and threats) analysis. The SWOT analysis is used to assess the strengths, weaknesses, opportunities, and challenges from the perspectives of the government, business actors, and QRIS

users. Meanwhile, linear regression is employed to support the SWOT analysis, with an equation constructed based on changes in trade balance measurements, referring to the financial flow equilibrium model. This relationship can be illustrated through the following equation:

$$\lambda = \alpha + \beta \tag{1}$$

The positive relationship in Eq. (1) indicates an interaction between financial flows and the changes resulting from RPC. Consequently, this relationship is expected to generate variations in the trade balance, as reflected in the following model:

$$\delta^{+} = \frac{\sum(\alpha+\beta)_t - \sum(\alpha+\beta)_{t-1}}{\sum(\alpha+\beta)_t} \tag{1a}$$

$$\delta^{-} = \frac{\sum(\alpha+\beta)_t - \sum(\alpha+\beta)_{t-1}}{\sum(\alpha+\beta)_t} \tag{1b}$$

The changes in the trade balance, as presented in Eqs. (1) and (1b), indicate that RPC can have a significant impact on the trade balance, with a measurable response determined by the values of δ^{+} or δ^{-}. These values are then substituted into Eq. (1), resulting in a modified measurement model that captures the reaction of financial flow movements, as shown in Eqs. (2a) and (2b) below.

$$\lambda^{+} = (\alpha_t + \beta_t) \leq (\alpha_{t-1} + \beta_{t-1}) \tag{2a}$$

$$\lambda^{-} = (\alpha_t + \beta_t) \geq (\alpha_{t-1} + \beta_{t-1}) \tag{2b}$$

Under normal distribution, financial flows have exhibited responses that align with the state of the art in this study. However, in economic relationships, financial activities are significantly influenced by the reaction of various macroeconomic elements that can affect financial flows, either directly or indirectly. As a result, these pressures can be incorporated into the measurement of trade balance stability, as represented in Eq. (3) below.

$$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu)) \tag{3}$$

The fluctuations in Eq. (3) arise from the high volatility of exports (η) and imports (μ) during certain periods, leading to pressure on financial flows and subsequently affecting the trade balance. RPC influences economic pressure through exchange rate fluctuations (γ), driven by the friction between export and import pressures. This relationship can be transformed into the following equation:

$$\lambda = \sum(\alpha(\gamma)) + \sum(\beta(\gamma)) \tag{3a}$$

As a result of this positive response, financial pressure shocks trigger internal reactions within financial flows. This indicates that the pressure has strongly intervened in macroeconomic financial policies through banking sector interactions. The export or import pressure caused by RPC, driven by exchange rate fluctuations, automatically influences interest rates (ξ) and inflationary pressure (ζ). This relationship can be represented by Eq. (4) below.

$$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta)) \tag{4}$$

The financial flows in Eq. (4) result from the effects of RPC, which subsequently cause significant reactions in trade balance fluctuations. To simplify this calculation, Eq. (4) can be refined by incorporating trade value (ς), which contracts in response to RPC. This refinement is represented in the following equation:

$$\lambda = \sum(\alpha(\varsigma)) + \sum(\beta(\varsigma)) \tag{4a}$$

Referring to the conceptual framework (Figure 3), the resulting equation is formed through various relationships, both external and internal, that influence macroeconomic performance. These interactions enable financial flows to alter the magnitude of the trade balance. Consequently, the overall model can be simplified through the following equation:

$$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma)) \tag{5}$$

The quality of the reaction from RPC, as shown in Eq. (5), reflects the strength of trade transactions in influencing economic pressure. This also serves as a measure or rationale for maintaining financial stability and economic growth based on cross-border transactions among ASEAN countries using this system. Consequently, the financial circulation model gains an indicator for determining the reaction to economic pressure, which may have negative effects due to adverse economic bubbles from other countries through RPC interactions.

Overall, Eqs. (1) to (5) show strength in answering the assumptions that have been proposed previously (Figure 3). First, the model is formed comprehensively through the financial activities diagnosis both internally and externally, therefore, financial interactions through the payment system in ASEAN region using QRIS become clear. Second, the model is formed complex, indicating that financial integration through the relationship of Central Bank performance integration in ASEAN region is effective. Therefore, the risk level in preventing financial crises between countries can be anticipated well through financial behavior screening, which indicates financial pressure. Third, this model is supported by the use of technology in financial transactions.

Further, the model has a relatively small bias index through various aspects. First, the macroeconomic pressures of each ASEAN region are different, indirectly influencing financial activities in each country. Second, the technology model used by each country in ASEAN influences the financial transactions speed and affects the financial fluctuations of each country. Third, policies in financial activities in the ASEAN region tend to be different, and can also affect the size of financial transactions through financial flows between countries.

However, this condition is anticipated through the formation of a systematic and complex model, and the findings in this study are stated to be perfect in expressing the integration of payment systems through QRIS in the ASEAN region.

4. RESULTS AND DISCUSSION

4.1 Opportunities, challenges, strengths, and weaknesses of the QRIS payment system as an alternative for payment system integration in the ASEAN region

Based on the regression model results, the use of QRIS as an RPC mechanism has a positive and significant impact on several macroeconomic indicators, including exports, imports, inflation, exchange rates, and trade balance. Meanwhile, interest rates appear to be a resistant variable (Table 1). This presents an opportunity for QRIS to be utilized as a cross-border payment instrument within ASEAN.

Table 1. The impact of QRIS usage on macroeconomic indicators

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-60787.89	10342.88	-5.877267	0.0000
Export	1.897990	0.221085	8.584904	0.0000
Import	0.297723	0.382715	0.777924	0.0393
Interest Rate	-48.16078	68.75678	-0.700451	0.4860
Inflation	12.06819	14.84974	0.812687	0.0092
Exchange Rate	0.155820	0.090158	1.728297	0.0484
Trade Balance	-0.209819	0.168333	-1.246454	0.0168
R-squared	0.721959	Mean dependent var		9598.026
Adjusted R-squared	0.697782	S.D. dependent var		2091.322
S.E. of regression	1149.691	Akaike info criterion		17.01996
Sum squared resid	91203544	Schwarz criterion		17.23463
Log likelihood	-639.7584	Hannan-Quinn criterion		17.10575
F-statistic	29.86082	Durbin-Watson stat		2.669609
Prob(F-statistic)	0.000000			

Source: Author's Work, 2025.

With probability values assessed through normal distribution measures and a parametric approach, this model is considered suitable for demonstrating the interdependence between variables. Based on the significance measurement of probability values, the determination coefficient is deemed sufficiently robust to represent the constructed model, with an R-squared value of 0.721959 and a highly significant Prob(F-statistic) value of 0.0000 (Table 1).

Meanwhile, Table 2 shows a significant relationship with QRIS, as indicated by the variables of exports, interest rates, inflation, exchange rates, and the trade balance. Additionally, a SWOT analysis reveals that only opportunities and threats have a strong correlation with QRIS adoption in Indonesia (Table 2).

The probability test using normal distribution and a parametric approach found that several indicators were significant at a 5% level, confirming the overall validity of the model in determining the degree of variable interdependence. Based on the significance measurement of probability values, the determination coefficient is considered sufficiently robust to represent the constructed model, with an R-squared value of 0.721959 and a highly significant Prob(F-statistic) value of 0.0000.

Regarding synergy, Table 3 illustrates the integration between financial performance and financial behavior in enhancing the effectiveness and efficiency of QRIS within the framework of strengthening trade cooperation across regions, benefiting governments, businesses, and users alike.

Table 3 presents a SWOT analysis for the government, focusing on strengths, weaknesses, opportunities, and threats. The government's strengths are relatively significant (λ = 0.0672), although the positive reaction is low (0.0198), indicating untapped potential. Weaknesses are identified with a value of λ = 0.496, and the negative reaction (0.0047) highlights challenges that need to be addressed. The available opportunities (λ = 0.508) suggest potential benefits, but the positive reaction (0.0485) indicates that these opportunities have not been fully optimized. Threats are also notable (λ = 0.0413) with a negative reaction (0.006), signaling the need for caution against external factors that may impact government performance. Overall, the government possesses strengths and opportunities but must focus on reducing weaknesses and mitigating threats to enhance its effectiveness.

Table 2. The relationship between QRIS usage and macroeconomic indicators and SWOT analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-62870.00	10569.62	-5.948183	0.0000
Export	1.872564	0.218920	8.553648	0.0000
Import	0.385640	0.397330	0.970579	0.3354
Interest Rate	-73.72682	69.35091	-1.063098	0.0027
Inflation	11.73886	14.84870	0.790565	0.0421
Exchange Rate	0.186179	0.094190	1.976629	0.0503
Strengths	-36.31780	80.49548	-0.451178	0.6534
Weaknesses	7.898367	98.97169	0.079804	0.9366
Opportunities	169.0251	88.33035	1.913556	0.0501
Threats	-135.2168	86.69922	-1.559608	0.0037
Trade Balance	-0.216755	0.177383	-1.221956	0.0261
R-squared	0.746972	Mean dependent var		9598.026
Adjusted R-squared	0.708045	S.D. dependent var		2091.322
S.E. of regression	1130.002	Akaike info criterion		17.03095
Sum squared resid	82998769	Schwarz criterion		17.36830
Log likelihood	-636.1762	Hannan-Quinn criterion		17.16577
F-statistic	19.18885	Durbin-Watson stat		2.615147
Prob(F-statistic)	0.000000			

Source: Author's Work, 2025.

Table 4 presents a SWOT analysis for business actors, focusing on strengths, weaknesses, opportunities, and threats. Business actors demonstrate a very high level of strength (λ = 0.9747) with a significant positive reaction (0.6527), indicating strong potential to achieve their objectives. Weaknesses are identified with a value of λ = 0.2735 and a negative reaction (0.0106), highlighting challenges that need to be addressed. The available opportunities (λ = 0.2578) suggest potential benefits, although the positive reaction (0.0206) indicates that these opportunities have not yet been fully optimized. Threats are also significant (λ = 0.9835) with a negative reaction (0.0009), emphasizing the need for caution against external factors that could impact performance. Overall, business actors possess substantial strengths but must address weaknesses and threats while leveraging available opportunities.

Table 5 presents a data analysis of the SWOT faced by QRIS users. Users exhibit very low strength (λ = 0.0367) with minimal positive reactions, indicating a lack of resources that can be leveraged. Weaknesses are quite significant (λ = 0.2249), and negative reactions highlight challenges that need to be addressed. The available opportunities (λ = 0.0495) have not been fully utilized, while threats (λ = 0.0200) are also considerable, emphasizing the need for caution regarding external factors that may impact performance. Overall, users need to enhance their capacity and strategies to overcome weaknesses and take advantage of available opportunities.

Table 3. SWOT analysis of QRIS usage according to the government

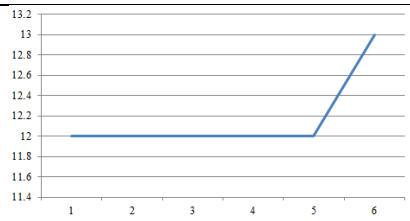
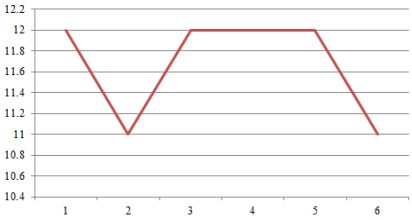
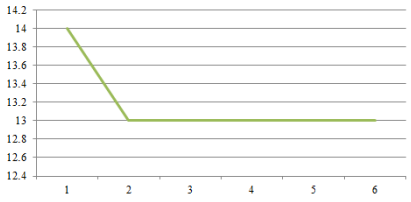
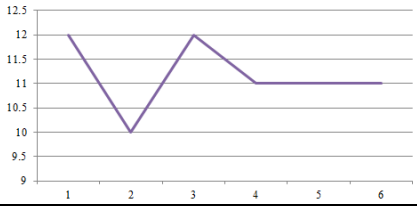
Government			
Analysis	**Data**	**Model Dimension**	**Reaction**
Strengths		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.0672 (-) 0.0198 (-) λ^+
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.0198 (-) 0.0008 (-) λ^+
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0047 (+) λ^+
Weaknesses		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.0496 (-) 0.0039 (-) λ^+
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.4446 (+) 0.5810 (-) λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0000 (+) λ^+
Opportunities		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.5088 (-) 0.0066 (-) λ^+
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.0485 (-) 0.0242 (+) λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0006 (-) λ^-
Threats		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.0413 (+) 0.0203 (-) λ^+
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.8522 (+) 0.0329 (-) λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0432 (+) λ^+

Table 4. SWOT of QRIS usage according to business actors

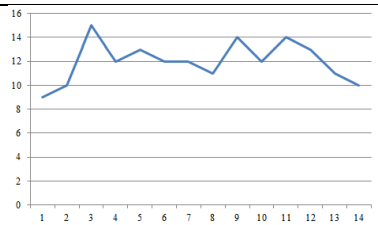
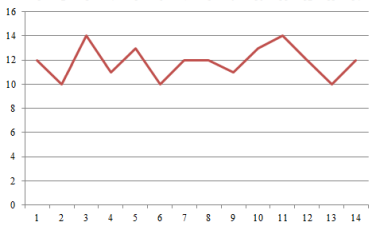
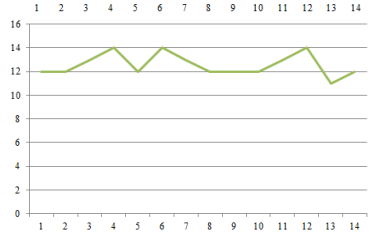
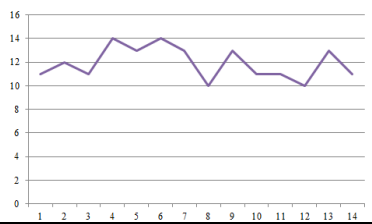
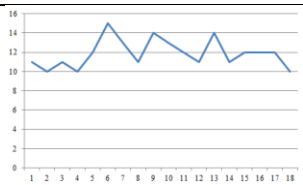
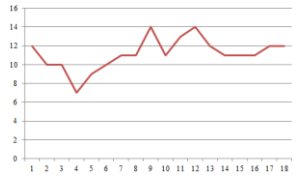
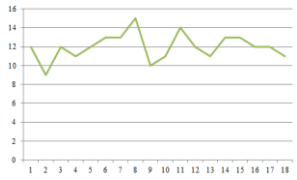
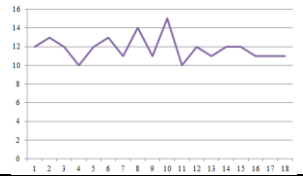
Business Actors			
Analysis	**Data**	**Model Dimension**	**Reaction**
Strengths		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.9747 (+) 0.6527 (-) λ^-
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.0003 (-) 0.0461 (+) λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0106 (+) λ^+
Weaknesses		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.2735 (-) 0.4513 (+) λ^+
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.6634 (-) 0.0002 (-) λ^+
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0221 (+) λ^+
Opportunities		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.2578 (-) 0.0381 (+) λ^-
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.0498 (+) 0.0206 (-) λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0183 (+) λ^+
Threats		$\lambda = \sum(\alpha(\eta+\mu)) + \sum(\beta(\eta+\mu))$	0.0000 (+) 0.0055 (-) λ^-
		$\lambda = \sum(\alpha(\xi+\zeta)) + \sum(\beta(\xi+\zeta))$	0.9835 (-) 0.0281 (-) λ^+
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0009 (-) λ^-

Table 5. SWOT of QRIS usage according to users

Users				
Analysis	**Data**	**Model Dimension**	**Reaction**	
Strengths		$\lambda = \sum(\alpha(\eta + \mu)) + \sum(\beta(\eta + \mu))$	0.0367 (-) 0.0000 (+)	λ^-
		$\lambda = \sum(\alpha(\xi + \zeta)) + \sum(\beta(\xi + \zeta))$	0.0324 (+) 0.9736 (+)	λ^+
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0095 (-)	λ^-
Weaknesses		$\lambda = \sum(\alpha(\eta + \mu)) + \sum(\beta(\eta + \mu))$	0.2239 (+) 0.2445 (+)	λ^+
		$\lambda = \sum(\alpha(\xi + \zeta)) + \sum(\beta(\xi + \zeta))$	0.0495 (-) 0.0000 (+)	λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0370 (-)	λ^-
Opportunities		$\lambda = \sum(\alpha(\eta + \mu)) + \sum(\beta(\eta + \mu))$	0.0026 (-) 0.0251 (-)	λ^+
		$\lambda = \sum(\alpha(\xi + \zeta)) + \sum(\beta(\xi + \zeta))$	0.7844 (+) 0.0262 (-)	λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0063 (+)	λ^+
Threats		$\lambda = \sum(\alpha(\eta + \mu)) + \sum(\beta(\eta + \mu))$	0.0200 (+) 0.0007 (-)	λ^-
		$\lambda = \sum(\alpha(\xi + \zeta)) + \sum(\beta(\xi + \zeta))$	0.0025 (-) 0.6862 (+)	λ^-
		$\lambda = \sum(\alpha(\gamma.\varsigma)) + \sum(\beta(\gamma.\varsigma))$	0.0126 (+)	λ^+

4.2 Implementation strategy through QRIS as an alternative for payment system integration in the ASEAN region

The integration of various stakeholders, including governments, the private sector, and consumers, is crucial for the successful implementation of the QRIS within the financial system. Governments play a regulatory and facilitative role, establishing frameworks that promote digital payment systems while ensuring consumer protection and financial inclusion [32, 33]. The private sector contributes by developing innovative technologies and services aligned with QRIS, enhancing user experience and accessibility [34]. Consumers, as end users, drive demand for these digital payment solutions, influencing market dynamics and encouraging businesses to adapt to their needs [35, 36].

This collaborative ecosystem fosters trust and transparency, which are essential for the widespread adoption of QRIS, ultimately leading to a more integrated and efficient financial landscape that benefits all stakeholders involved [37, 38]. By recognizing and leveraging the unique contributions of each stakeholder, QRIS integration can significantly enhance the overall effectiveness of the financial system.

4.2.1 The role of the state or government (Regulator)

The role of the state in the comprehensive integration of financial systems, particularly through the implementation of the QRIS, is crucial for driving economic growth and financial inclusion. The Indonesian government, through BI, has established QRIS as a standardized payment system that facilitates cashless transactions across various platforms, enhancing payment efficiency for MSMEs [39]. This initiative not only promotes the adoption of digital payments but also fosters innovation in the financial sector, leading to increased trust and engagement among consumers and businesses [40, 41].

Furthermore, government support is essential in providing the necessary infrastructure and regulatory framework to ensure the reliability and security of QRIS, thereby creating an environment conducive to long-term adoption [42, 43]. Ultimately, the state's involvement is critical in bridging the gap between traditional and digital financial systems, contributing to a more inclusive economic landscape [44].

4.2.2 The role of the private sector

The private sector plays a vital role in integrating financial systems through the implementation of QRIS by leveraging its innovative capabilities and competitive edge. Private companies are instrumental in developing and enhancing digital payment solutions aligned with QRIS standards, ensuring seamless transactions across multiple platforms [45, 46]. Their involvement not only accelerates the adoption of cashless payment systems but also fosters a culture of continuous improvement and customer satisfaction, which is essential for meeting the evolving demands of consumers [47, 48].

Additionally, private sector entities often possess the technical expertise and operational efficiency necessary for the effective deployment of such systems, contributing to the overall resilience of the financial ecosystem [49]. By collaborating with government initiatives and leveraging public-private partnerships (PPPs), the private sector can enhance financial inclusion and drive economic growth, ensuring that QRIS functions as a viable solution for both consumers and businesses [50, 51].

4.2.3 The role of consumers

Consumers play a pivotal role in the comprehensive integration of financial systems, particularly through their engagement with digital financial services like QRIS. Their participation is essential in driving demand for innovative financial products and services, which, in turn, encourages

financial institutions to improve their offerings and service delivery [52].

Moreover, financial literacy significantly influences consumers' ability to navigate these systems effectively, as well-informed users are more likely to utilize available financial tools and services, thereby contributing to the overall stability and efficiency of the financial ecosystem [53, 54]. Additionally, consumer behavior and preferences shape market dynamics, prompting businesses to adapt and innovate in response to their needs, further driving a more integrated financial landscape [55]. Ultimately, active consumer engagement not only enhances their financial well-being but also supports the broader objectives of financial inclusion and economic growth.

5. CONCLUSIONS

An integrated payment system is crucial and necessary to achieve sustainable economic growth among ASEAN member countries. The analysis results indicate that QRIS has a positive impact on macroeconomic indicators such as exports, imports, exchange rates, and trade balance. This is due to the advantages of a cashless payment system, which is more convenient, faster, and secure. The demand for QRIS is expected to increase in line with the growing frequency and value of financial transactions, particularly in trade. This creates a significant market opportunity for the expansion of QRIS as an alternative for payment system integration in the ASEAN region, not only in Indonesia but also in the other nine member countries. However, this also presents challenges, as the increasing number of users requires QRIS to continuously improve service quality and maintain transaction security.

One of the main weaknesses of QRIS implementation is the necessity for service providers to be prepared to integrate payment systems, such as QR codes, real-time payments, and interoperability. This process requires time, financial investment, and readiness in terms of infrastructure, technology, and regulations. Additionally, external threats such as macroeconomic conditions and other external factors pose risks that must be anticipated by banks, the government, and QRIS service providers.

Given these circumstances, a strategic approach is required for the successful implementation of QRIS across ASEAN. Policy recommendations to support the integration of the payment system through QRIS in the ASEAN region include the following. First, ASEAN governments need to strengthen cross-border cooperation in harmonizing digital payment regulations to ensure better interoperability. Second, investment in digital infrastructure, such as stable and widespread internet networks, must be prioritized to support QRIS adoption. Third, financial literacy programs, particularly for MSMEs, should be enhanced to ensure that businesses can fully leverage this digital payment system. Additionally, establishing a specialized body to monitor and evaluate QRIS implementation across ASEAN could be a strategic step to ensure the sustainability and effectiveness of this system.

Although this study provides valuable insights into the interoperability of QRIS in Indonesia, several limitations must be acknowledged when interpreting the findings. One of the primary limitations is the relatively small sample size of 85 respondents and the restricted geographical coverage, which is limited to three regions in Indonesia (Batam, Yogyakarta, and West Nusa Tenggara). This may limit the generalizability of the study's findings to a broader context, particularly within the ASEAN region, which exhibits diverse economic and technological characteristics. Additionally, this study has not thoroughly explored external factors such as regulatory differences, digital infrastructure, and the level of technology adoption in other ASEAN countries. These factors play a crucial role in determining the extent to which QRIS interoperability can be implemented at the regional level. The lack of analysis on these aspects may affect a comprehensive understanding of the challenges and opportunities associated with cross-border payment system implementation. Therefore, the findings of this study should be interpreted with these limitations in mind. Future research with a broader geographical scope, a larger sample size, and an in-depth analysis of regulatory and technological factors at the regional level will be essential to gaining a more comprehensive understanding and enhancing the external validity of this study's results.

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