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FINANCIAL LITERACY, PERCEPTIONS, AND QRIS ADOPTION AS DRIVERS OF COMPETITIVE ADVANTAGE: EVIDENCE FROM MADURA CONVENIENCE STORES IN INDONESIA

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Abstract
This study aimed to analyze the effect of Perceived Ease of Use, Perceived Usefulness, Perceived Security, and Financial Literacy on Competitive Advantage through Technology Adoption among Micro and Small Enterprises of Warung Madura using QRIS in Bekasi City. The study was motivated by the rapid adoption of QRIS among MSMEs, yet the extent to which QRIS adoption contributes to competitive advantage remains underexplored, particularly in traditional retail contexts such as Warung Madura. A quantitative approach was employed with a sample of one hundred stall owners and managers selected through purposive sampling techniques. Data analysis was carried out using the Partial Least Square Structural Equation Modeling method through SmartPLS 4.0. The results indicated that Perceived Ease of Use, Perceived Usefulness, and Perceived Security had positive and significant effects on Technology Adoption and Competitive Advantage. Technology Adoption was also proven to have a positive effect on Competitive Advantage and successfully mediated the influence of Perceived Ease of Use, Perceived Usefulness, and Perceived Security on Competitive Advantage. In contrast, Financial Literacy had no significant effect on Technology Adoption or Competitive Advantage, and Technology Adoption failed to mediate this relationship due to the lack of integration of the bookkeeping system in the QRIS application. In conclusion, the adoption of QRIS driven by convenience, technical benefits, and security factors has proven to be able to create a competitive advantage for Warung Madura.

Keywords: Perceived Ease of Use, Perceived Usefulness, Perceived Security, Financial Literacy, Technology Adoption

1. Introduction

Along with the times, the use of cash in economic transactions is slowly starting to be abandoned. This shift is driven by the perception of people who feel that carrying physical money, such as banknotes and metals, is less efficient and inconvenient. Bank Indonesia (2018) noted that transactions that previously required face-to-face interaction with cash can now be done remotely in a matter of seconds. This convenience is facilitated by the emergence of Financial Technology (FinTech) which integrates financial services with digital technology, transforming conventional business models to be more modern and efficient. The development of FinTech has triggered innovations in payment systems, one of which is through digital payment platforms such as applications and digital wallets. This trend has become a global phenomenon, where digital wallets control 50% of E-commerce transactions and 30% of transactions in physical stores. In the Asia-Pacific region, the figure is even higher, reaching 70% for online payments and 50% for offline transactions. China is recorded as a pioneer in digital wallet adoption, with 82% of e-

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commerce transactions and 66% of offline purchases in 2023 using the platform, driven by the Alipay, WeChat Pay, and UnionPay ecosystems. Globally, the transaction value of digital wallets reached a fantastic figure of IDR 226,800 trillion, and is projected to continue to grow.

In Indonesia, the phenomenon of payment digitalization is becoming more real with the presence of the Quick Response Code Indonesian Standard (QRIS). Launched on August 17, 2019 by Bank Indonesia (BI) together with the Indonesian Payment System Association (ASPI), QRIS is present as a national standard to facilitate digital transactions from various electronic money applications, digital wallets, and mobile banking. The presence of QRIS solves the problem of fragmentation of QR code-based payment systems that were previously not interoperable, making it difficult for merchants and consumers. QRIS is designed based on the CEMUAH (Fast, Efficient, Easy, Cheap, Ubiquitous, and Safe) principles to improve financial inclusion and transaction efficiency across sectors, including for Micro and Small Enterprises (MSEs). Digital transformation in Indonesia can be seen from the significant surge in the use of QRIS. In 2024, QRIS transactions will soar 226.54% year-on-year, reaching 50.50 million users and 32.71 million merchants. This growth is inversely proportional to ATM/debit card transactions which decreased by 8.42% in the same period. The number of QRIS merchants continues to increase from 24 million at the end of 2022 to a projected 41 million in 2025, which is in line with the increase in total transactions which reached 1.46 billion in the third quarter of 2025. The rapid growth of QRIS adoption is inseparable from the contribution of the MSME sector. MSMEs play a vital role in the Indonesian economy, dominating 99% of the business ecosystem, contributing 60.5% of GDP, and absorbing 96.9% of the workforce.

The urgency of this research is driven by several critical factors. First, the rapid adoption of QRIS among MSMEs has created a new competitive landscape in the retail sector, yet the extent to which QRIS adoption contributes to competitive advantage remains underexplored, particularly in specific regional contexts such as Madura, where traditional convenience stores operate within unique cultural and economic environments. Second, financial literacy has been recognized as a critical determinant of technology adoption and business performance, yet the relationship between financial literacy, perceptions of digital payment systems, and QRIS adoption in driving competitive advantage among convenience stores in Madura remains inadequately understood. Third, previous studies on QRIS adoption have primarily focused on technical aspects, user acceptance, or adoption barriers, while limited attention has been given to the strategic implications of QRIS adoption for competitive advantage in the retail sector. Fourth, the convenience store sector in Madura faces unique challenges, including intense competition from modern retailers, changing consumer preferences, and the need to adapt to digital payment trends, making it an ideal context for examining how QRIS adoption can be leveraged to achieve competitive advantage. Fifth, empirical evidence on the relationships among financial literacy, perceptions, QRIS adoption, and competitive advantage in the context of Madura convenience stores remains limited, necessitating renewed investigation with more comprehensive research designs and context-specific data.

Previous research has shown significant but fragmented findings regarding the determinants and consequences of QRIS adoption among MSMEs. Studies have demonstrated that financial literacy positively influences the adoption of digital payment systems by enhancing business owners' understanding of digital financial products and

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their benefits (Bank Indonesia, 2018; OJK, 2020). Research has shown that positive perceptions of digital payment systems, including perceived ease of use and perceived usefulness, significantly influence adoption decisions (Davis, 1989; Venkatesh et al., 2003). Studies have also identified that QRIS adoption can enhance operational efficiency, increase transaction volume, and improve customer convenience, which may contribute to competitive advantage (Bank Indonesia, 2021). However, these studies have examined these relationships in isolation, leaving a significant gap in understanding how financial literacy and perceptions collectively influence QRIS adoption and how QRIS adoption ultimately contributes to competitive advantage in specific regional contexts such as Madura.

The research gap in this study lies in the limited understanding of how financial literacy and perceptions influence QRIS adoption and how QRIS adoption contributes to competitive advantage among convenience stores in Madura. While individual studies have examined the direct effects of financial literacy on technology adoption or the role of perceptions in shaping adoption decisions, the integrated framework connecting these elements remains underexplored (Venkatesh et al., 2003; OJK, 2020). Additionally, most previous studies have focused on urban or general MSME contexts, leaving a significant gap in knowledge regarding the dynamics of QRIS adoption and competitive advantage in specific regional contexts such as Madura, where cultural, economic, and infrastructural characteristics create distinct challenges and opportunities for digital payment adoption.

The novelty of this research lies in several aspects. First, this study focuses on convenience stores in Madura, representing a unique context characterized by traditional retail practices, strong cultural values, and specific consumer behavior patterns that distinguish it from other regions in Indonesia. Second, this study develops an integrative model that simultaneously examines the influence of financial literacy and perceptions on QRIS adoption, as well as the influence of QRIS adoption on competitive advantage, providing a more comprehensive understanding of the determinants and consequences of digital payment adoption in the retail sector. Third, this study positions QRIS adoption as a strategic mechanism that transforms financial literacy and positive perceptions into competitive advantage, offering insights into how digital payment adoption can be leveraged to enhance business competitiveness. Fourth, this study contributes to the limited empirical evidence on QRIS adoption and competitive advantage in the Indonesian retail sector, providing context-specific insights that can inform policy and business practice. Fifth, this study extends the application of Technology Acceptance Model (TAM) and Resource-Based View (RBV) to the context of digital payment adoption in traditional retail settings, validating theoretical predictions in an under-researched institutional context (Davis, 1989; Barney, 1991).

The purpose of this study is to examine the influence of financial literacy and perceptions on QRIS adoption and its impact on competitive advantage among convenience stores in Madura. In addition, this study aims to evaluate the mediating role of QRIS adoption in the relationship between financial literacy, perceptions, and competitive advantage. The choice of this goal was driven by the limited understanding of how financial literacy and perceptions translate into QRIS adoption and how QRIS adoption contributes to competitive advantage in the context of traditional retail businesses in Madura. With a comprehensive examination of these relationships, this study aims to provide a deeper understanding of how digital payment adoption can be

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strategically leveraged to enhance competitive advantage among convenience stores in Madura.

The contribution of this research is multifaceted. From a theoretical perspective, this research contributes to the enrichment of literature on digital payment adoption and competitive advantage by proposing and testing an integrative model that links financial literacy and perceptions with QRIS adoption and competitive advantage, extending the application of TAM and RBV to the context of traditional retail businesses in regional Indonesia. The findings contribute to the understanding of how financial literacy and perceptions influence QRIS adoption and how QRIS adoption mediates the relationship between these factors and competitive advantage, providing a more nuanced theoretical framework for analyzing digital payment adoption in traditional retail settings. From a practical perspective, this study provides actionable insights for convenience store owners, policymakers, and financial service providers in designing and implementing strategies to enhance QRIS adoption and competitive advantage. For convenience store owners, the findings provide guidance on how to leverage financial literacy and positive perceptions to enhance QRIS adoption and competitiveness. For policymakers, the results offer insights into the importance of financial literacy programs and digital payment infrastructure in supporting MSMEs. For financial service providers, this study provides evidence on the mechanisms through which QRIS adoption contributes to competitive advantage, supporting the design of more effective marketing and support programs for MSMEs in Madura and similar regions.

2. Theoretical Background

2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), explains that individual acceptance of technology is determined by two primary constructs: Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). PEOU is conceptualized as the extent to which a person believes that using a particular technology system will be free from hard effort, both physically and cognitively. PU is defined as the individual's subjective belief that adopting a specific technological system will directly improve performance, productivity, and work effectiveness. In the context of QRIS adoption among convenience stores in Madura, TAM provides a robust framework for understanding how business actors evaluate the practicality and functional benefits of digital payment systems before deciding to adopt them. The tendency of business actors to integrate technology into their daily service routines is strongly influenced by their perceptions of how easy and useful the technology is for their operations (Davis, 1989; Venkatesh et al., 2003).

Research by Khairiah et al. (2025) proves that an uncomplicated and simple system in the transaction process positively and significantly improves individual decisions in adopting QRIS as a payment method. These findings are reinforced by Christian and Indriyarti (2024), which emphasize that the high mobility of urban communities requires the availability of practical and user-friendly payment methods, where this practicality is very helpful for the smooth operation of business actors. Furthermore, Saputra et al. (2025) and Ikwanto and Indriani (2024) noted that the intuitive QRIS system is able to reduce psychological and technical barriers among MSMEs, so that technology adoption can occur organically. However, a review of the literature shows anomalies and inconsistencies related to the strength of PEOU's influence. Research by Sari et al. (2022) regarding the decision to use electronic wallets found that PEOU did not have a

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significant influence partially on the adoption decision. The study indicates that as users have adapted and become accustomed to the digital ecosystem, ease of use is no longer the main driving factor but is displaced by other considerations such as perceived security and functional added value. This critical view is also in line with the findings of Balaskas et al. (2025), which highlight that in certain technology ecosystems, ease of use only acts as a baseline, while trust factors and risk perception often go beyond the convenience aspect.

2.2 Perceived Usefulness and Technology Adoption

In addition to operational convenience, Perceived Usefulness (PU) plays a central role as a key determinant in the Technology Acceptance Model (TAM). Davis (1989) defines PU as the individual's subjective belief that adopting a specific technological system will directly improve job performance, productivity, and work effectiveness. In the realm of information systems, this variable represents the rationalization of users regarding the tactical and strategic added value of an innovation. Various empirical literature confirms the dominance of PU variables in shaping user behavior. Research by Ikwanto and Indriani (2024) specifically highlights that the perception of benefits has a positive and significant influence on the adoption of QRIS in the MSME sector. The presence of technology that offers practical solutions to limited resources is a rational reason for MSMEs to carry out digital transformation. This is reinforced by Sari et al. (2022), who argue that the success of the acceptance of a technology depends on the extent to which users' expectations for more productive results can be met. In line with this, Pratama and Anas (2024) emphasize that effectiveness in completing financial transactions is a crucial element that places the benefit aspect as the most prominent determinant compared to other factors.

Although the theoretical foundation of TAM places PU as the main driving force, a review of recent studies reveals dynamics and inconsistencies in findings. Research by Setiawan (2025) found that the perception of benefits does not directly encourage the actual use of a system but must go through the stage of forming the intention to use (behavioral intention) first as a mediating variable. This means that technology that is considered useful is not necessarily immediately adopted without a mature psychological boost. On the other hand, Grace and Ayuningtyas (2024) provide a critical note that the influence of benefit perception is not always universal; in conditions where there is a technical skill gap or privacy concerns, perceived benefits sometimes fail to have a significant influence on adoption decisions. This difference in academic findings indicates that the functional value of a technology will not necessarily drive the adoption process if it is not accompanied by the technical readiness of its users.

2.3 Perceived Security and Financial Transaction Trust

In the digital transaction ecosystem, Perceived Security (PS) or the perception of security is the fundamental foundation that ensures the continuity of the operation of a technology. Conceptually, Chellappa and Pavlou (2002) define PS as the subjective probability that users believe that their financial information and personal data will not be viewed, stored, or manipulated by unauthorized parties during the electronic transaction process. The crucial role of PS in encouraging technology adoption has been proven by various empirical literature. Khairiah et al. (2025) emphasize that security is not just a technical feature but a psychological foundation that builds user trust through data protection and minimization of the risk of abuse. This is reinforced by studies by

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Sari et al. (2022), which found that protective security elements such as PIN authentication systems, OTPs, and data encryption significantly provided a sense of security that encouraged users to adopt e-wallet platforms on a wide scale. Furthermore, Herman and Sendjaja (2025) highlight an important phenomenon where in high-risk systems (such as the financial sector), security factors can even go beyond the aspect of ease of operation; users are willing to tolerate complicated procedures in order to get maximum protection for their assets. Kerans et al. (2025) also add that a sense of security that is built consistently will guarantee sustainability (continuity intent) of the use of digital services in the midst of cyber threat dynamics.

However, a review of several other studies shows inconsistent results. Research by Saputra et al. (2025) in the context of MSMEs found that trust in security did not have a significant influence directly on optimizing the use of QRIS. The study indicates that even if businesses trust the security aspect, it does not necessarily trigger adoption if it is not supported by the ease of use factor as the main mediator. Similar conclusions were put forward by Pratama and Anas (2024), which found that in certain user segments, perceived security no longer significantly affected adoption intent. This phenomenon occurs because modern users tend to consider security features as mandatory standards (baselines) that are automatically installed, so they prioritize the practical benefits and efficiency of access.

2.4 Financial Literacy and Business Actors' Readiness

In the operational context of Micro, Small, and Medium Enterprises (MSMEs), financial literacy (FL) plays a fundamental role. Based on the definition of the Financial Services Authority (OJK, 2024), financial literacy is a comprehensive combination of individual understanding, ability, and confidence that directly influences attitudes and behaviors in managing financial resources effectively. When viewed through the lens of Resource-Based View (RBV), a qualified understanding of financial literacy is an intangible resource that is very valuable for companies (Barney, 1991). Within the framework of the Technology Acceptance Model (TAM), FL acts as a crucial external variable that shapes the user's perception of the ease (PEOU) and usefulness (PU) of a system. The ability of business actors to understand risks, calculate cost efficiency, and manage cash flow transparency is a logical foundation for them to transition from conventional payment methods to digital platforms such as QRIS.

The positive link between financial literacy and technology acceptance has been documented in various studies. Wardani and Pituringsih (2025) emphasize that FL is the main foundation that equips individuals with evaluative skills to dissect the benefits while mitigating the risks of using digital financial services. In line with this, Damayanti and Putri (2025) in their study found that FL had a positive and significant effect on the decision to adopt QRIS by MSMEs. Financially literate business actors are proven to be more prepared and confident in utilizing technology because they are able to make reasonable and measurable business decisions. This is reinforced by the view of Putri and Friyatmi (2025), which highlights that good financial literacy will lead business actors to use electronic wallet services not only as an instant transaction tool but also as a strategic instrument to improve their business financial governance.

However, the academic discourse on the effectiveness of FL is also colored by anomalies and contradictory results. Research by Pratama and Anas (2024) on millennials found that financial literacy did not have a significant effect on the intention to adopt a digital payment system. These findings indicate that for segments that are already very

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familiar with technology, functional understanding of the platform (such as efficiency and practicality) dominates adoption decisions much more than the level of financial managerial intelligence itself. Surprising results were also presented by Nugraha et al. (2022), which found that individuals with low financial literacy are sometimes more active in using financial technology because of its ease of access compared to conventional banking services. Furthermore, from the perspective of business performance, Susilatri et al. (2024) and Satria et al. (2026) reveal that financial literacy often fails to have a real impact on competitive advantage if it is not balanced with administrative discipline (such as the separation of personal and business money), so that the literacy only stagnates at the concept level.

2.5 Resource-Based View (RBV) and Competitive Advantage

The Resource-Based View (RBV), developed by Barney (1991), explains that sustainable competitive advantage is achieved when a firm possesses resources and capabilities that are valuable, rare, imperfectly imitable, and non-substitutable (VRIN). In the context of QRIS adoption among convenience stores in Madura, digital payment adoption can be viewed as a strategic capability that enables firms to enhance operational efficiency, improve customer service, and differentiate themselves from competitors. Financial literacy, as an intangible resource, combined with positive perceptions of technology and QRIS adoption, creates a unique combination of resources and capabilities that can contribute to competitive advantage. The integration of these resources and capabilities enables convenience stores to respond more effectively to changing consumer preferences and competitive pressures, thereby strengthening their market position and long-term sustainability (Barney, 1991; Porter, 2008).

2.6 Hypothesis Development

2.6.1 The Effect of Perceived Ease of Use on Technology Adoption

Perceived Ease of Use (PEOU) is conceptualized as the extent to which a person believes that using a particular technology system will be free from hard effort (Davis, 1989). In the context of QRIS adoption among convenience stores in Madura, PEOU reflects the extent to which business actors perceive QRIS as a payment system that is practical, simple, and easy to operate in their daily transactions. Research by Khairiah et al. (2025) proves that an uncomplicated and simple system in the transaction process positively and significantly improves individual decisions in adopting QRIS as a payment method. These findings are reinforced by Christian and Indriyarti (2024), which emphasize that practical and user-friendly payment methods are very helpful for the smooth operation of business actors. Furthermore, Sinurat and Sugiyanto (2022) and Saputra et al. (2025) noted that the intuitive QRIS system is able to reduce psychological and technical barriers among MSMEs, so that technology adoption can occur organically. Based on the theoretical explanation and empirical findings, the following hypothesis is proposed:

H1: Perceived Ease of Use has a positive effect on Technology Adoption.

2.6.2 The Effect of Perceived Usefulness on Technology Adoption

Perceived Usefulness (PU) is defined as the individual's subjective belief that adopting a specific technological system will directly improve job performance, productivity, and work effectiveness (Davis, 1989). In the context of QRIS adoption among convenience stores in Madura, PU reflects the extent to which business actors believe that QRIS will

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improve transaction efficiency, enhance financial recording accuracy, and increase customer satisfaction. Research by Ikwanto and Indriani (2024) specifically highlights that the perception of benefits has a positive and significant influence on the adoption of QRIS in the MSME sector. The presence of technology that offers practical solutions to limited resources is a rational reason for MSMEs to carry out digital transformation. This is reinforced by Sari et al. (2022), who argue that the success of the acceptance of a technology depends on the extent to which users' expectations for more productive results can be met. In line with this, Pratama and Anas (2024) emphasize that effectiveness in completing financial transactions is a crucial element that places the benefit aspect as the most prominent determinant compared to other factors. Based on the theoretical explanation and empirical findings, the following hypothesis is proposed:

H2: Perceived Usefulness has a positive effect on Technology Adoption.

2.6.3 The Effect of Perceived Security on Technology Adoption

Perceived Security (PS) is defined as the subjective probability that users believe that their financial information and personal data will not be viewed, stored, or manipulated by unauthorized parties during the electronic transaction process (Chellappa & Pavlou, 2002). In the context of QRIS adoption among convenience stores in Madura, PS reflects the extent to which business actors trust that QRIS provides adequate protection for their financial transactions and personal data. Research by Khairiah et al. (2025) emphasizes that security is not just a technical feature but a psychological foundation that builds user trust through data protection and minimization of the risk of abuse. This is reinforced by studies by Sari et al. (2022), which found that protective security elements such as PIN authentication systems, OTPs, and data encryption significantly provided a sense of security that encouraged users to adopt e-wallet platforms on a wide scale. Furthermore, Herman and Sendjaja (2025) highlight that in high-risk systems (such as the financial sector), security factors can even go beyond the aspect of ease of operation. Based on the theoretical explanation and empirical findings, the following hypothesis is proposed:

H3: Perceived Security has a positive effect on Technology Adoption.

2.6.4 The Effect of Financial Literacy on Technology Adoption

Financial Literacy (FL) is defined as a comprehensive combination of individual understanding, ability, and confidence that directly influences attitudes and behaviors in managing financial resources effectively (OJK, 2024). In the context of QRIS adoption among convenience stores in Madura, FL reflects the extent to which business actors possess the knowledge, skills, and confidence to evaluate the benefits and risks of digital payment systems and make informed adoption decisions. Research by Wardani and Pituringsih (2025) emphasizes that FL is the main foundation that equips individuals with evaluative skills to dissect the benefits while mitigating the risks of using digital financial services. In line with this, Damayanti and Putri (2025) in their study found that FL had a positive and significant effect on the decision to adopt QRIS by MSMEs. Financially literate business actors are proven to be more prepared and confident in utilizing technology because they are able to make reasonable and measurable business decisions. This is reinforced by the view of Putri and Friyatmi (2025), which highlights that good financial literacy will lead business actors to use electronic wallet services not only as an instant transaction tool but also as a strategic instrument to improve their business financial governance. Based on the theoretical explanation and empirical findings, the following hypothesis is proposed:

H4: Financial Literacy has a positive effect on Technology Adoption.

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2.6.5 The Effect of Technology Adoption on Competitive Advantage

Technology Adoption reflects the extent to which business actors integrate digital payment systems such as QRIS into their daily operations and service routines. In the context of convenience stores in Madura, Technology Adoption reflects the extent to which business actors have adopted and consistently use QRIS as a payment method in their transactions. Based on the Resource-Based View (RBV), digital payment adoption can be viewed as a strategic capability that enables firms to enhance operational efficiency, improve customer service, and differentiate themselves from competitors (Barney, 1991). Research has shown that QRIS adoption can enhance operational efficiency, increase transaction volume, and improve customer convenience, which may contribute to competitive advantage. The integration of digital payment systems enables convenience stores to respond more effectively to changing consumer preferences and competitive pressures, thereby strengthening their market position and long-term sustainability (Porter, 2008). Based on the theoretical explanation and empirical findings, the following hypothesis is proposed:

H5: Technology Adoption has a positive effect on Competitive Advantage.

2.6.6 The Mediating Role of Technology Adoption

Technology Adoption is positioned as a mediating mechanism that transforms financial literacy and perceptions into competitive advantage. Based on the Technology Acceptance Model (TAM) and Resource-Based View (RBV), financial literacy and positive perceptions of technology (PEOU, PU, PS) influence the decision to adopt digital payment systems, which in turn contributes to competitive advantage. Research has demonstrated that technology adoption mediates the relationship between individual and organizational factors and business performance outcomes (Venkatesh et al., 2003; Barney, 1991). In the context of convenience stores in Madura, the adoption of QRIS enables business actors to translate their financial knowledge and positive perceptions into tangible operational improvements that enhance competitiveness. Based on the theoretical explanation and empirical findings, the following hypotheses are proposed:

H6: Technology Adoption mediates the relationship between Perceived Ease of Use and Competitive Advantage.

H7: Technology Adoption mediates the relationship between Perceived Usefulness and Competitive Advantage.

H8: Technology Adoption mediates the relationship between Perceived Security and Competitive Advantage.

H9: Technology Adoption mediates the relationship between Financial Literacy and Competitive Advantage.

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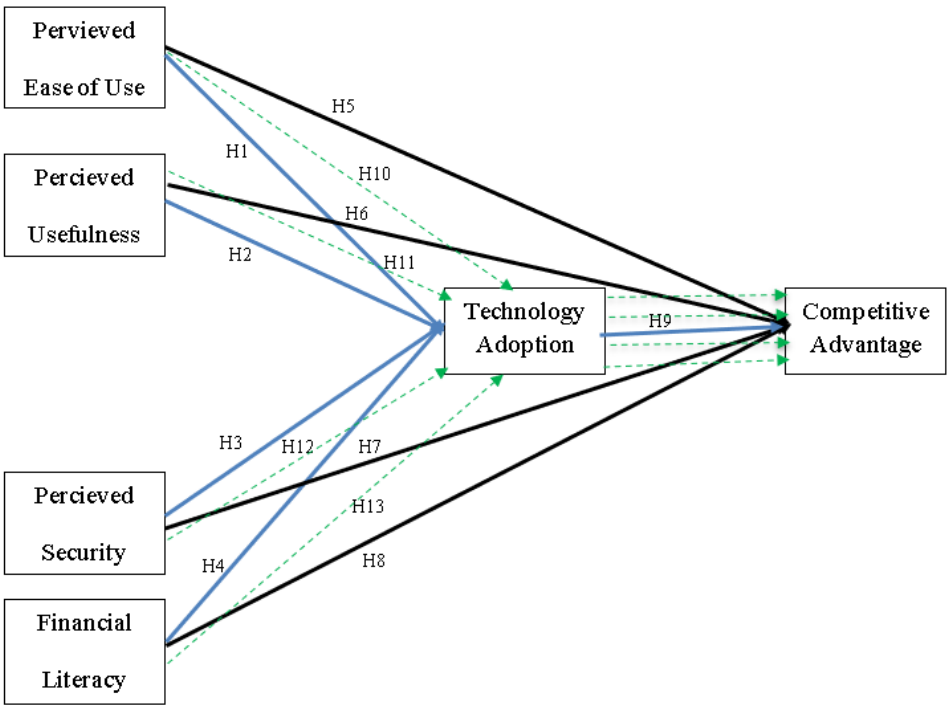


Figure 1. Research Model

3. Methods

3.1 Research Design

This study uses a quantitative approach designed to test hypotheses and analyze the cause-and-effect relationship between research variables. The quantitative approach is considered appropriate because the study aims to empirically test the proposed hypotheses using statistical analysis of numerical data collected from respondents. The explanatory research design enables the examination of causal relationships between independent variables (Perceived Ease of Use, Perceived Usefulness, Perceived Security, and Financial Literacy), mediating variable (Technology Adoption), and dependent variable (Competitive Advantage). The main subject in this study is the Micro and Small Enterprises (MSEs) of Warung Madura that utilize QRIS payment technology.

3.2 Population and Sample

The research population includes all owners or managers of Warung Madura in the territory of Bekasi City. Given the existing limitations, sampling was carried out using the non-probability sampling method with purposive sampling techniques. Respondents were selected based on specific criteria, namely: the owner or manager of Warung Madura located in the Bekasi City area, has been operating for at least 1 year, and has actively adopted the QRIS payment system for at least 1 year. Based on the guidelines for the number of indicators, the minimum sample size was set at 90 respondents, and in actual this study succeeded in collecting data from 100 valid respondents.

3.3 Data Collection Techniques

Primary data collection was carried out through direct survey techniques by visiting Warung Madura's operational location and distributing questionnaires to respondents. This face-to-face approach aims to minimize respondents' misperceptions in understanding the details of the statement. Each variable instrument in the questionnaire

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which includes Perceived Ease of Use, Perceived Usefulness, Perceived Security, Financial Literacy, Technology Adoption, and Competitive Advantage was measured using a 5-point Likert Scale, which ranged from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire was designed based on operational definitions of research variables and adapted from validated measurement scales from previous studies, tailored to the context of Warung Madura in Bekasi City.

3.4 Operational Definition of Variables

The operational definitions of the variables examined in this study are presented in Table 1.

Table 1. Operational Definition and Measurement of Variables

Variable	Definition	Indicators	Scale	References
Perceived Ease of Use (X_1)	The extent to which a person believes that using QRIS will be free from hard effort	Simplicity of transaction process; ease of operation; intuitive system; minimal technical barriers	Likert 1-5	Davis (1989); Khairiah et al. (2025)
Perceived Usefulness (X_2)	The individual's subjective belief that adopting QRIS will improve business performance	Transaction efficiency; financial recording accuracy; productivity improvement; customer satisfaction	Likert 1-5	Davis (1989); Ikwanto & Indriani (2024)
Perceived Security (X_3)	The subjective probability that users believe their financial information will not be manipulated by unauthorized parties	Data protection; transaction security; risk mitigation; trust in system	Likert 1-5	Chellappa & Pavlou (2002); Khairiah et al. (2025)
Financial Literacy (X_4)	The combination of individual understanding, ability, and confidence in managing financial resources	Financial knowledge; risk understanding; cost efficiency calculation; cash flow management	Likert 1-5	OJK (2024); Damayanti & Putri (2025)
Technology Adoption (M)	The extent to which business actors integrate QRIS into their daily operations	Frequency of use; consistency of use; integration into operations; commitment to use	Likert 1-5	Venkatesh et al. (2003); Ikwanto & Indriani (2024)
Competitive Advantage (Y)	The extent to which a firm possesses resources and capabilities that	Operational efficiency; customer service quality; market	Likert 1-5	Barney (1991); Porter (2008)

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Variable	Definition	Indicators	Scale	References
	enable superior performance	differentiation; business sustainability		

Source: Developed for this research (2026)

3.5 Data Analysis Techniques

The data analysis method used is Partial Least Square - Structural Equation Modeling (PLS-SEM) by utilizing SmartPLS 4.0 software. This method was chosen because of its ability to process complex research models with mediation variables. The analysis is carried out in two main stages:

1) Evaluation of Outer Model: Aims to ensure the quality of the instrument. The tests included convergent validity (Loading Factor parameter > 0.7), discriminant validity (Average Variance Extracted/AVE parameter > 0.5), and internal reliability measured through Composite Reliability and Cronbach's Alpha values (> 0.7).
2) Internal Model Evaluation: Aims to predict the strength and significance of the relationship between variables. This evaluation includes measurement of Determination Coefficient (R-Square), direct hypothesis testing through Path Coefficients, and mediating effects testing through Specific Indirect Effects. The hypothesis is statistically acceptable if the P-Value is less than 0.05 (< 0.05) or the T-Statistic value is greater than 1.96.

4. Results and Discussion

4.1 Results

Table 2. Convergent Validity Test Results (Outer Loadings)

Indicator	CA	FL	PEOU	PS	PU	TA
CA1	0.848					
CA2	0.837					
CA3	0.830					
FL1		0.957				
FL2		0.940				
FL3		0.924				
PEOU1			0.875			
PEOU2			0.852			
PEOU3			0.845			
PS1				0.918		
PS2				0.850		
PS3				0.878		
PU1					0.855	
PU2					0.799	
PU3					0.821	
TA1						0.865
TA2						0.808
TA3						0.785

Note: CA = Competitive Advantage; FL = Financial Literacy; PEOU = Perceived Ease of Use; PS = Perceived Security; PU = Perceived Usefulness; TA = Technology Adoption

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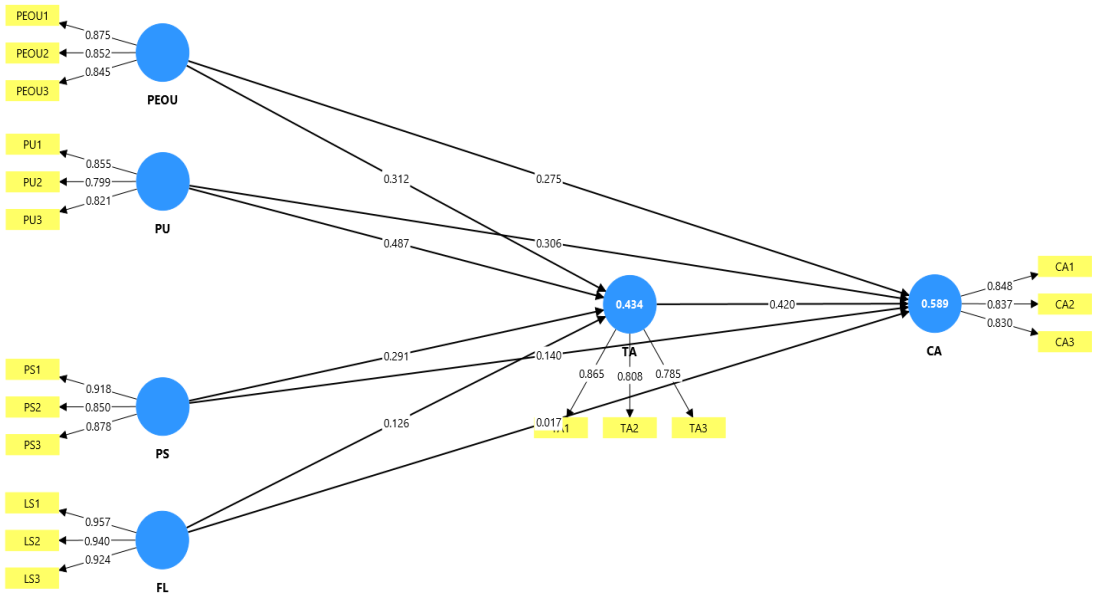


Figure 2. Outer Model Path Diagram

Source: Data processed by researchers (SmartPLS 4.0), 2026

Table 2 presents the convergent validity test results based on outer loadings. Based on the path chart in Figure 2, all indicators show a loading factor value of > 0.70, which indicates the fulfillment of convergent validity and good reliability. The Competitive Advantage (CA) construct exhibits loading values ranging from 0.830 to 0.848, Financial Literacy (FL) from 0.924 to 0.957, Perceived Ease of Use (PEOU) from 0.845 to 0.875, Perceived Security (PS) from 0.850 to 0.918, Perceived Usefulness (PU) from 0.799 to 0.855, and Technology Adoption (TA) from 0.785 to 0.865. Thus, all indicators are declared valid and reliable.

Table 3. Discriminant Validity Test Results (Average Variance Extracted)

Variable	AVE	Conclusion
Competitive Advantage (CA)	0.703	Valid
Financial Literacy (FL)	0.884	Valid
Perceived Ease of Use (PEOU)	0.735	Valid
Perceived Security (PS)	0.779	Valid
Perceived Usefulness (PU)	0.681	Valid
Technology Adoption (TA)	0.672	Valid

Source: Data processed by researchers (SmartPLS 4.0), 2026

Table 3 presents the discriminant validity test results based on Average Variance Extracted (AVE) values. The AVE value for all study variables shows a number greater than the recommended minimum limit, which is > 0.50. Because all AVE values are above 0.50, it can be concluded that all variables in this study have met the conditions of excellent convergent validity. The lowest AVE value is found in the Technology Adoption (TA) variable of 0.672, but this value is still far above the minimum criterion of 0.50. This shows that the variance of the indicators extracted by each of its constituent constructs is very adequate. Thus, it can be concluded that all measuring instruments in this research model have met the criteria of discriminant validity.

Table 4. Reliability Test Results

Variable	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)
CA	0.792	0.808	0.877

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Variable	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)
FL	0.936	1.004	0.958
PEOU	0.822	0.845	0.893
PS	0.862	0.925	0.914
PU	0.768	0.782	0.865
TA	0.757	0.766	0.860

Source: Data processed by researchers (SmartPLS 4.0), 2026

Table 4 presents the reliability test results. Based on the results of the reliability test in the table above, it can be seen that all research variables show an excellent level of reliability. The value as a whole has met the required criteria, which is greater than 0.70 (> 0.70). In line with these results, Cronbach's Alpha values for all variables also showed satisfactory numbers, ranging from 0.757 to 0.936, all of which were also above the minimum limit of the standard reliability (> 0.70). Thus, it can be concluded that all measurement instruments (questionnaires) used to represent each variable in this study are declared reliable and consistent.

Table 5. Coefficient of Determination Results (R-Square)

Variable	R-Square	R-Square Adjusted	Interpretation
Technology Adoption (TA)	0.410	0.410	Moderate
Competitive Advantage (CA)	0.567	0.567	Moderate

Source: Data processed by researchers (SmartPLS 4.0), 2026

Table 5 presents the coefficient of determination results. The evaluation of the structural model (inner model) showed an Adjusted R-Square value for the Technology Adoption (TA) variable of 0.410 and Competitive Advantage (CA) of 0.567. Referring to the criteria of Hair et al. (2021), both values are classified as moderate. This indicates that the variables in the research model were able to explain 41% of the variance in technology adoption decisions and 56.7% of the variance in competitive advantage, while the rest were influenced by external factors outside the model. In the context of business behavior, this level of determination is considered solid and has adequate predictive capabilities.

Table 6. Hypothesis Test Results (Path Coefficients)

Hypothesis	Relationship	Original Sample (O)	T-Statistics	P-Values	Decision
H1	PEOU → TA	0.312	4.012	0.000	Supported
H2	PU → TA	0.487	6.136	0.000	Supported
H3	PS → TA	0.291	3.628	0.000	Supported
H4	FL → TA	0.126	1.407	0.080	Not Supported
H5	TA → CA	0.420	4.965	0.000	Supported
H6	PEOU → CA	0.275	3.943	0.000	Supported
H7	PU → CA	0.306	4.059	0.000	Supported
H8	PS → CA	0.140	1.776	0.038	Supported
H9	FL → CA	0.017	0.217	0.414	Not Supported

Source: Data processed by researchers (SmartPLS 4.0), 2026

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Table 5 presents the hypothesis testing results based on path coefficients. Hypothesis testing was carried out by evaluating the value of path coefficients through a bootstrapping procedure. A hypothesis is declared acceptable and has a statistically significant influence if it meets the criteria of a P-Value of < 0.05 or a T-Statistic > 1.96 (Hair et al., 2021). The results show that Perceived Ease of Use has a significant positive effect on Technology Adoption (β = 0.312, t = 4.012, p = 0.000), supporting H1. Perceived Usefulness has a significant positive effect on Technology Adoption (β = 0.487, t = 6.136, p = 0.000), supporting H2. Perceived Security has a significant positive effect on Technology Adoption (β = 0.291, t = 3.628, p = 0.000), supporting H3. However, Financial Literacy does not have a significant effect on Technology Adoption (β = 0.126, t = 1.407, p = 0.080), indicating that H4 is not supported. Technology Adoption has a significant positive effect on Competitive Advantage (β = 0.420, t = 4.965, p = 0.000), supporting H5. Perceived Ease of Use has a significant positive effect on Competitive Advantage (β = 0.275, t = 3.943, p = 0.000), supporting H6. Perceived Usefulness has a significant positive effect on Competitive Advantage (β = 0.306, t = 4.059, p = 0.000), supporting H7. Perceived Security has a significant positive effect on Competitive Advantage (β = 0.140, t = 1.776, p = 0.038), supporting H8. However, Financial Literacy does not have a significant effect on Competitive Advantage (β = 0.017, t = 0.217, p = 0.414), indicating that H9 is not supported.

Table 7. Specific Indirect Effects Results (Mediation Analysis)

Hypothesis	Indirect Relationship	Original Sample (O)	T-Statistics	P-Values	Decision
H10	FL → TA → CA	0.053	1.331	0.092	Not Supported
H11	PEOU → TA → CA	0.131	2.944	0.002	Supported
H12	PS → TA → CA	0.122	2.628	0.004	Supported
H13	PU → TA → CA	0.204	3.970	0.000	Supported

Source: Data processed by researchers (SmartPLS 4.0), 2026

Table 7 presents the specific indirect effects results for mediation analysis. Specific indirect effect testing was conducted to evaluate the mediating role of Technology Adoption (TA) in the research model. The test results prove that TA is significantly able to mediate the effect of Perceived Ease of Use (P-Value = 0.002), Perceived Usefulness (P-Value = 0.000), and Perceived Security (P-Value = 0.004) on Competitive Advantage (CA). On the other hand, TA was declared to have failed to mediate the relationship between Financial Literacy and Competitive Advantage because the acquisition of a P-Value of 0.092 which was above the significance level of 0.05.

4.2 Discussion

4.2.1 Perceived Ease of Use Affects Technology Adoption and Competitive Advantage

The hypothesis testing results indicate that Perceived Ease of Use (PEOU) has a positive and significant effect on Technology Adoption, with a coefficient value of 0.312 and a probability value of 0.000, indicating that H1 is accepted. This finding suggests that business actors who perceive QRIS as a payment system that is practical, simple, and easy to operate are more likely to adopt the technology in their daily operations. The results confirm that PEOU has a positive and significant effect on Technology Adoption

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and Competitive Advantage. This is in line with the findings of Khairiah et al. (2025) and Ikwanto and Indriani (2024), which state that the efficiency and ease of the system are the main catalysts for the digital transformation of MSMEs. These findings support the Technology Acceptance Model (TAM) theory, which states that convenience and benefits are the basic determinants of technology acceptance (Davis, 1989).

Furthermore, PEOU also has a positive and significant direct effect on Competitive Advantage, with a coefficient value of 0.275 and a probability value of 0.000, indicating that H6 is accepted. This finding suggests that the ease of using QRIS directly contributes to the competitiveness of Warung Madura by enabling faster transaction processing, reducing operational errors, and improving customer service quality. Business actors who find QRIS easy to use can integrate the technology more effectively into their operations, thereby enhancing their ability to compete with modern retailers and other traditional stores.

4.2.2 Perceived Usefulness Affects Technology Adoption and Competitive Advantage

The hypothesis testing results indicate that Perceived Usefulness (PU) has a positive and significant effect on Technology Adoption, with a coefficient value of 0.487 and a probability value of 0.000, indicating that H2 is accepted. This finding suggests that business actors who believe QRIS will improve transaction efficiency, enhance financial recording accuracy, and increase customer satisfaction are more likely to adopt the technology. The results confirm that PU has a positive and significant effect on Technology Adoption and Competitive Advantage. This is in line with the findings of Khairiah et al. (2025) and Ikwanto and Indriani (2024), which state that the efficiency and ease of the system are the main catalysts for the digital transformation of MSMEs. These findings support the Technology Acceptance Model (TAM) theory, which states that convenience and benefits are the basic determinants of technology acceptance (Davis, 1989).

Furthermore, PU also has a positive and significant direct effect on Competitive Advantage, with a coefficient value of 0.306 and a probability value of 0.000, indicating that H7 is accepted. This finding suggests that the perceived benefits of QRIS directly contribute to the competitiveness of Warung Madura by enabling operational efficiency, improving financial transparency, and enhancing customer convenience. Business actors who recognize the functional value of QRIS are more likely to leverage the technology strategically to differentiate themselves from competitors and improve business performance.

4.2.3 Perceived Security Affects Technology Adoption and Competitive Advantage

The hypothesis testing results indicate that Perceived Security (PS) has a positive and significant effect on Technology Adoption, with a coefficient value of 0.291 and a probability value of 0.000, indicating that H3 is accepted. This finding suggests that business actors who trust QRIS provides adequate protection for their financial transactions and personal data are more likely to adopt the technology. Transaction security has a positive and significant effect on adoption and competitiveness. This strengthens the study of Sari et al. (2022) and Khairiah et al. (2025), which places the security aspect as a psychological foundation for business actors to fully trust the digital system.

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Furthermore, PS also has a positive and significant direct effect on Competitive Advantage, with a coefficient value of 0.140 and a probability value of 0.038, indicating that H8 is accepted. This finding suggests that the perception of security directly contributes to the competitiveness of Warung Madura by reducing the risk of fraud, protecting business assets, and enhancing customer trust. Business actors who perceive QRIS as secure are more likely to use the technology consistently and integrate it into their customer service strategy, thereby strengthening their market position.

4.2.4 Financial Literacy Does Not Affect Technology Adoption and Competitive Advantage

The hypothesis testing results indicate that Financial Literacy (FL) does not have a significant effect on Technology Adoption, with a coefficient value of 0.126 and a probability value of 0.080, indicating that H4 is not supported. Similarly, FL does not have a significant effect on Competitive Advantage, with a coefficient value of 0.017 and a probability value of 0.414, indicating that H9 is not supported. This study found that Financial Literacy had no significant effect on both adoption and competitive advantage. These results are in line with the findings of Pratama and Anas (2024), which state that in certain segments, functional factors (practical/beneficial) dominate adoption decisions more than the level of financial literacy. In addition, Susilatri et al. (2024) also found that financial literacy often fails to have a real impact on competitive advantage if it is not accompanied by administrative discipline (record-keeping).

In the context of Warung Madura, this insignificance occurs because QRIS only functions as a payment receiving tool without adequate bookkeeping or accounting integration features. Business actors may possess financial knowledge, but without the integration of bookkeeping features in technology platforms, financial literacy remains passive knowledge for business owners. The findings suggest that financial literacy alone is insufficient to drive technology adoption or competitive advantage unless it is supported by administrative discipline and technology platforms that facilitate financial management integration.

4.2.5 Technology Adoption Affects Competitive Advantage

The hypothesis testing results indicate that Technology Adoption (TA) has a positive and significant effect on Competitive Advantage, with a coefficient value of 0.420 and a probability value of 0.000, indicating that H5 is accepted. This finding demonstrates that the adoption of QRIS significantly creates a competitive advantage for Warung Madura. This is in line with Luo et al. (2024), which emphasizes that digital transformation is a key factor in strengthening business competitiveness. These findings also support the results of Anatasia et al. (2023) and Arina et al. (2025) that the adoption of digital payments enables MSMEs to achieve excellence through operational efficiency and service flexibility.

The adoption of QRIS enables Warung Madura to process transactions more quickly, reduce cash handling risks, and offer customers greater convenience. These operational improvements translate into tangible competitive advantages, including enhanced customer satisfaction, increased transaction volume, and improved market positioning relative to competitors. The findings confirm that technology adoption serves as a strategic mechanism that transforms organizational resources and capabilities into sustainable competitive advantage, consistent with the Resource-Based View (RBV) framework (Barney, 1991).

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4.2.6 The Mediating Role of Technology Adoption

The hypothesis testing results indicate that Technology Adoption mediates the relationship between Perceived Ease of Use and Competitive Advantage, with an indirect effect coefficient of 0.131 and a probability value of 0.002, indicating that H11 is accepted. Technology Adoption also mediates the relationship between Perceived Usefulness and Competitive Advantage, with an indirect effect coefficient of 0.204 and a probability value of 0.000, indicating that H13 is accepted. Furthermore, Technology Adoption mediates the relationship between Perceived Security and Competitive Advantage, with an indirect effect coefficient of 0.122 and a probability value of 0.004, indicating that H12 is accepted. The test results prove that Technology Adoption is able to mediate the influence of PEOU, PU, and PS on competitive advantage significantly. This supports the study of Abbas et al. (2025), which states that the adoption of technology acts as a "bridge" mechanism that transforms the internal capabilities of the business into a real advantage.

However, Technology Adoption fails to mediate the influence of Financial Literacy on Competitive Advantage, with an indirect effect coefficient of 0.053 and a probability value of 0.092, indicating that H10 is not supported. This confirms that without the integration of bookkeeping features in technology platforms, financial literacy is just passive knowledge for business owners. The findings suggest that the mediating role of technology adoption is contingent upon the nature of the antecedent factors, with functional and security-related perceptions being more effectively translated into competitive advantage through technology adoption than financial knowledge.

5. Conclusion

This study aimed to analyze the effect of Perceived Ease of Use, Perceived Usefulness, Perceived Security, and Financial Literacy on Competitive Advantage through Technology Adoption among Micro and Small Enterprises of Warung Madura using QRIS in Bekasi City. Using a quantitative approach with Partial Least Square Structural Equation Modeling on one hundred stall owners and managers selected through purposive sampling techniques, the study successfully tested the direct and indirect relationships among the research variables and examined the mediating role of Technology Adoption.

The results indicate that Perceived Ease of Use, Perceived Usefulness, and Perceived Security have positive and significant effects on Technology Adoption and Competitive Advantage. Perceived Ease of Use enables business actors to integrate QRIS into their daily operations more effectively by reducing technical and psychological barriers, thereby enhancing transaction speed and customer convenience. Perceived Usefulness encourages adoption by providing tangible benefits such as transaction efficiency, improved financial recording accuracy, and increased customer satisfaction. Perceived Security builds business actors' trust in digital transactions by protecting their financial information and reducing the risk of fraud. These findings confirm that operational efficiency and a sense of security in digital transactions are the main foundations in winning the retail market competition. Technology Adoption also has a positive and significant effect on Competitive Advantage, demonstrating that the adoption of QRIS enables Warung Madura to achieve superior performance through improved service quality, operational efficiency, and market differentiation. This finding aligns with the Resource-Based View, which explains that technology adoption serves as a strategic

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capability that transforms organizational resources into sustainable competitive advantage (Barney, 1991; Porter, 2008).

The mediation analysis reveals that Technology Adoption significantly mediates the influence of Perceived Ease of Use, Perceived Usefulness, and Perceived Security on Competitive Advantage. This confirms that technology adoption acts as a vital mediating mechanism, where new technology becomes an instrument of competitive advantage if business actors are committed to integrating it into long-term business routines. In contrast, Financial Literacy does not show a significant influence on Technology Adoption or Competitive Advantage, and Technology Adoption fails to mediate this relationship. This insignificance confirms the gap between the financial literacy of business actors and the QRIS application features, which are currently purely transactional without the integration of the bookkeeping system. Without the integration of bookkeeping features in technology platforms, financial literacy remains passive knowledge for business owners and does not automatically translate into adoption decisions or competitive advantage. This finding is consistent with previous research emphasizing that financial literacy often fails to have a real impact on business performance if it is not accompanied by administrative discipline (Susilatri et al., 2024; Pratama & Anas, 2024).

The theoretical contribution of this study lies in the integration of the Technology Acceptance Model and the Resource-Based View into a single conceptual framework that explains how perceptions of ease, usefulness, and security drive technology adoption and competitive advantage in traditional retail settings. This study extends the application of both theoretical frameworks to the context of QRIS adoption among Warung Madura in Bekasi City, validating theoretical predictions in an under-researched institutional context.

From a practical perspective, this study provides actionable insights for Warung Madura owners, policymakers, and financial service providers. Warung Madura owners should prioritize the adoption of QRIS and leverage its functional benefits to differentiate themselves from competitors. Policymakers should promote QRIS adoption among MSMEs through financial literacy programs, technical training, and infrastructure development, as well as encourage the development of QRIS features that support bookkeeping and financial management integration. Financial service providers should focus on enhancing the ease of use, usefulness, and security of QRIS while developing features that integrate bookkeeping and financial management capabilities to enhance the value proposition of QRIS for MSMEs.

This study has several limitations that should be acknowledged. First, the study focused only on Warung Madura in Bekasi City, which may limit the generalizability of the findings to other regions or types of MSMEs. Second, the study used a cross-sectional design, which limits the ability to establish causal relationships between variables. Third, the study relied on self-reported data from respondents, which may be subject to social desirability bias and common method bias. Fourth, the study did not examine the moderating role of individual differences such as age, education level, or business experience in the relationships examined.

Future research should expand the geographical scope to include other regions and types of MSMEs to enhance the generalizability of the findings. Researchers should employ longitudinal designs to examine how the relationships between Perceived Ease of Use, Perceived Usefulness, Perceived Security, Financial Literacy, Technology Adoption, and Competitive Advantage evolve over time. Future studies should also

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examine the moderating role of individual differences such as age, education level, and business experience in the relationships examined. Finally, future research could employ mixed-method approaches to provide richer insights into the mechanisms through which technology adoption influences competitive advantage in traditional retail settings.

In conclusion, this study contributes to the growing body of literature on technology adoption and competitive advantage by providing empirical evidence on the determinants and consequences of QRIS adoption among Warung Madura in Bekasi City. The findings suggest that Perceived Ease of Use, Perceived Usefulness, and Perceived Security are the key factors influencing Technology Adoption and Competitive Advantage, with Technology Adoption serving as a vital mediating mechanism. As Indonesia continues to promote digital payment adoption among MSMEs, understanding these factors becomes increasingly important for developing effective strategies to strengthen business competitiveness and promote sustainable economic transformation in the traditional retail sector.

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