COUNT: Journal of Accounting, Business and Management *ISSN 3026-6130*
Vol. 4, No. 2, 2026, pp. 453 ~ 470
Open Acces: *https://doi.org/10.61677/count.v4i2.971*

A RISK MANAGEMENT AND TECHNOLOGY READINESS LEVEL-BASED FINANCING FEASIBILITY MODEL FOR DISASTER AFFECTED MSMEs

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Received August 12, 2026; Revised November 3, 2026; Accepted November 3, 2026; Published November 4, 2026

ABSTRACT

Access to formal financing is challenging for micro, small, and medium enterprises (MSMEs) exposed to disasters. This study aims to examine a financing feasibility model integrating Financing Risk Management and Technology Readiness Level (TRL) among MSMEs in Banda Aceh, Indonesia. A sequential explanatory mixed-methods design involved 100 purposively selected MSMEs, complemented by interviews and focus group discussions with financing stakeholders. Quantitative analysis included descriptive statistics, construct assessment, regression, and a Risk–TRL financing feasibility matrix. Both Financing Risk Management (coefficient = 0.462, $p < 0.001$) and TRL (coefficient = 0.381, $p < 0.001$) were positively associated with financing feasibility; the model explained 61.2% of its variance ($R^2 = 0.612$). Financing history scored highest among risk-management indicators, whereas digital transactions scored highest for technology readiness. The matrix classified 60% of participating MSMEs into the higher financing-feasibility categories. Integrating risk-management capability and operational digital readiness may complement conventional lending assessments for disaster-exposed MSMEs. The proposed matrix offers a context-specific screening framework requiring further validation before adoption in other settings.

Keywords: *Disaster-affected MSMEs, financing feasibility, financing risk management, technology readiness, financial inclusion.*

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are the backbone of Indonesia's economy, contributing more than 60% to the national Gross Domestic Product (GDP) and employing approximately 97% of the workforce. However, MSMEs' access to formal financing remains a major challenge. Various studies indicate that the majority of MSMEs still face limitations in obtaining bank loans or financing from other financial institutions due to high perceived risk, limited collateral, and the poor quality of business information held by MSME operators. On the other hand, the rise in non-performing loans (NPLs) in the MSME sector has prompted financial institutions to implement increasingly stringent credit assessment processes. This situation creates a dilemma between efforts to expand financial inclusion and the need to maintain the quality of the financing portfolio (Satriyono, 2025).

This problem becomes even more complex when MSMEs operate in areas with high disaster vulnerability. Indonesia is one of the countries with the highest risk of natural disasters in the world, including earthquakes, tsunamis, floods, landslides, and

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other hydrometeorological disasters. The increase in the frequency and intensity of disasters in recent years has caused significant economic losses, including impacts on the sustainability of MSME businesses. Most MSMEs affected by disasters experience a decline in revenue, damage to productive assets, disruptions to supply chains, and difficulties in meeting previously agreed-upon financing obligations. Therefore, a financing approach that focuses solely on the historical financial condition of MSMEs is no longer sufficient to assess a business's ability to withstand future risks (Misbah & Harun, 2026).

The city of Banda Aceh is one region with extensive experience in coping with various natural disasters, particularly following the 2004 tsunami and the various hydrometeorological disasters that continue to occur to this day. These experiences demonstrate that the SME sector is the group most vulnerable to operational disruptions during disasters. Although various economic recovery programs have been implemented by the government and financial institutions, many SMEs still face barriers in accessing post-disaster financing. This situation highlights the need for a financing eligibility assessment model that not only considers traditional financial aspects but also takes into account SMEs' ability to manage disaster risks and maintain business sustainability.

Despite playing a very significant role, MSMEs still face various structural obstacles that hinder their growth and business sustainability. One of the main issues is limited access to formal financing. Various reports indicate that the MSME financing gap in Indonesia remains relatively high because most financial institutions view MSMEs as a business segment that carries greater financing risk compared to medium- and large-scale companies. As a result, many MSMEs that are viable from a business perspective still fail to meet the financing criteria set by banks, fintech companies, and other financial institutions.

This issue of access to financing becomes even more complex when MSMEs are located in areas with high disaster vulnerability. In recent years, the paradigm of economic development has shifted from focusing solely on business profitability to also emphasizing a business's ability to withstand various external risks, including disaster risks. Natural disasters not only cause physical damage to business assets but also disrupt supply chains, distribution, marketing, cash flow, and even the ability of business owners to meet their financing obligations to financial institutions. Under such conditions, a financing assessment model that relies solely on historical financial statements becomes less relevant because it fails to capture a business's resilience to extreme external disruptions.

In the context of SME financing, the implementation of risk management is a critical factor that can enhance financial institutions' confidence in a borrower's capabilities. Financing risk management encompasses a business's ability to identify, assess, control, and mitigate various risks that could threaten business continuity. SMEs with robust risk management systems tend to be better equipped to withstand uncertainties in the business environment, including disaster risks. Therefore, risk management not only serves as a tool for business protection but can also be a key

indicator in financial institutions' assessment of financing eligibility (Satriyono, 2025).

Recent evidence suggests that digital financial inclusion can ease financing constraints by improving information availability and lowering barriers to credit applications (Lu et al., 2022; Zhang et al., 2023; Chen & Yuan, 2024). At the same time, disaster recovery research emphasizes that financing access alone is insufficient without business continuity planning and adaptive capacity (Chang et al., 2022; Sadeghi, 2022).

In addition to risk factors, the advancement of digital transformation has introduced a new dimension in business viability assessment: the Technology Readiness Level (TRL). The TRL concept describes an organization's level of technological readiness to adopt, utilize, and integrate digital technologies into its business processes. Recent research indicates that technological readiness has a significant impact on productivity, operational efficiency, competitiveness, and the ability of SMEs to access digital financial services. SMEs with higher levels of technology readiness generally have better financial record-keeping, stronger business analysis capabilities, and broader access to various financing alternatives, including fintech lending and other digital financial services (Faiz et al., 2024). addition to risk factors, digital transformation has shifted the paradigm of business feasibility assessments in various countries. Advances in digital technology have led to the emergence of the Technology Readiness Level (TRL) concept as a measure of an organization's or business's readiness to adopt and utilize technology. Technology readiness is becoming increasingly important because modern business activities rely heavily on the use of digital technology for financial record-keeping, marketing, electronic transactions, customer management, and business decision-making. Various recent studies indicate that MSMEs with higher levels of technology readiness tend to exhibit better productivity, greater operational efficiency, and a stronger ability to adapt to changes in the business environment.

However, studies examining the relationship between Technology Readiness Level (TRL) and financing eligibility remain relatively limited. Most previous research has focused on the impact of digitalization on business performance, while the integration of technology readiness into financing assessment models has not been widely explored. As a result, financial institutions often fail to recognize the true potential of SMEs that actually have strong business prospects because they have effectively leveraged digital technology.

Based on this literature review and empirical observations, there is a clear research gap. First, research on SME financing feasibility generally remains focused on traditional financial factors and has not yet integrated aspects of disaster risk management. Second, research on Technology Readiness Level is primarily directed toward improving business performance and innovation, rather than serving as an instrument for assessing financing feasibility. Third, there has been little research that simultaneously examines the influence of Financing Risk Management and Technology Readiness Level on the financing feasibility of disaster-affected SMEs, particularly in the context of SMEs in Banda Aceh.These research gaps highlight the need to develop a financing feasibility model that is more adaptive to modern business challenges. A model that integrates aspects of

Financing Risk Management and Technology Readiness Level (TRL) is expected to provide a more comprehensive approach compared to conventional financing models. This model not only helps financial institutions reduce financing risks but also provides greater opportunities for resilient, adaptive, and technologically ready SMEs to gain access to formal financing.

This study is expected to produce a new empirical model capable of explaining how Financing Risk Management and Technology Readiness Level influence the financing feasibility of disaster-affected MSMEs in Banda Aceh. The findings of this study are expected to contribute to the development of theories on MSME financing, risk management, and technology, while also serving as a foundation for financial institutions, local governments, and regulators in formulating MSME financing policies that are more inclusive, resilient, and sustainable.

Although the importance of risk management and technology readiness has been widely discussed in the literature, research integrating these two aspects into a financing feasibility model specifically for disaster-affected MSMEs remains relatively limited. Most financing assessment models used by financial institutions still focus on conventional approaches such as the 5C principles (Character, Capacity, Capital, Collateral, and Condition of the Economy), without comprehensively considering MSMEs' ability to manage disaster risks and their level of technological readiness. As a result, many MSMEs that actually have good business potential are still unable to meet formal financing criteria because there are no assessment tools capable of accommodating these specific characteristics (Satriyono, 2025). Given this phenomenon, a financing feasibility model that is more adaptive to the conditions of disaster-affected MSMEs is needed. The integration of Financing Risk Management and Technology Readiness Level (TRL) variables is expected to produce a more comprehensive assessment model for measuring MSMEs' ability to obtain and manage financing sustainably. This model is not only beneficial for financial institutions in reducing credit risk but can also assist the government in designing policies to strengthen access to financing for MSMEs located in disaster-prone areas.This study aims to examine the associations of Financing Risk Management and Technology Readiness Level with financing feasibility among disaster-affected MSMEs in Banda Aceh and to develop a complementary Risk–TRL financing feasibility screening matrix.

The choice to examine financial management and digital capability together is consistent with prior MSME research linking financial record-keeping and digital literacy to resilience (Noor & Sriyono, 2024).

RESEARCH METHOD

This study employs a mixed-methods approach with a sequential explanatory design, which combines quantitative and qualitative approaches in sequence (Affandi et al., 2024). The quantitative approach was used to examine the relationship between the variables of Financing Risk Management, Technology Readiness Level (TRL), and MSME Financing Feasibility. Furthermore, the qualitative approach was used to deepen

the understanding of the factors influencing financing feasibility through interviews and Focus Group Discussions (FGDs) with MSME stakeholders and financial institutions. The sequential explanatory design was selected to quantify associations and derive an initial screening matrix before using stakeholder perspectives to contextualize and assess the practical interpretation of the quantitative results.

This study is explanatory in nature because it aims to explain the influence of Financing Risk Management and Technology Readiness Level on the financing feasibility of disaster-affected MSMEs and to develop a financing feasibility model that can be used by financial institutions.

The research was conducted in the city of Banda Aceh, which was selected because it is an area with a relatively high level of disaster vulnerability and has a large number of active MSMEs across diverse business sectors. The research activities were organized over a 6–8-month period, covering the stages of instrument preparation, data collection, data analysis, model validation, and the preparation of the research report.

The study population consists of all active MSMEs in Banda Aceh City that meet the following criteria: Have been in operation for at least 2 years; (a) Are registered with the Banda Aceh City Cooperative and SME Agency; (b) Have previously applied for or received formal financing from a bank, fintech company, or cooperative; (c) Have ongoing financial activities; (d) Use at least one form of digital technology in their business operations.

The sampling technique used was purposive sampling, which involves selecting respondents based on specific criteria aligned with the research objectives (Mamulak et al., 2026). The analyzed sample comprised 100 MSMEs that met the research criteria. In addition to MSME respondents, the study also involved: (a) 5 financial institutions (banks, credit unions, and fintech companies); (b) representatives from the Department of Cooperatives and MSMEs; (c) academics or MSME financing practitioners as focus group discussion (FGD) participants. A Likert scale was used because it effectively captures respondents' levels of agreement (Kadiyono, 2024).

There are three research variables: the first independent variable is Financing Risk Management (X1), with indicators including business liquidity, income stability, and financing/credit history. The second independent variable is Technology Readiness Level (TRL), with indicators including the digitization of financial records, the use of digital transactions, and digital platform integration. This study has one dependent variable, namely Financing Feasibility, with indicators including the Feasibility Score and Financing Risk Level.

Interviews were conducted with MSME operators to gather information on the challenges of obtaining post-disaster financing, the ability to manage business risks, the level of digital technology adoption, and barriers to digital transformation. Interviews were also conducted with five financial institutions to gather information regarding financing assessment criteria, credit analysis mechanisms, risk factors considered, and the impact of technology use on financing decisions. This study also conducted focus group discussions (FGDs) with banks, fintech companies, cooperatives, academics, and

SME practitioners to test the model's suitability, gather feedback for model improvements, and validate the indicators and financing eligibility scores (Amalia et al., 2024). The research model tested is:

$$Y = \beta0 + \beta1X1 + \beta2X2 + e$$

Where:
Y : Financing Eligibility
X1 : Financing Risk Management
X2 : Technology Readiness Level
β0 : Constant
β1, β2 : Regression coefficients
e : Error term

The data analysis techniques used in this study consist of (a) descriptive analysis, which includes respondent profiles, MSME characteristics, financing risk levels, and technology readiness levels; (b) Factor analysis using the Kaiser-Meyer-Olkin (KMO) theory, Bartlett's Test of Sphericity, and Exploratory Factor Analysis (EFA) to identify the factor structure, simplify indicators, and establish the research constructs; (c) Validity and Reliability Tests; (d) Linear Regression Analysis, used to determine the effect of Financing Risk Management on financing feasibility and the effect of Technology Readiness Level on financing feasibility, using the equation:

$$KP = \alpha + \beta1MRP + \beta2TRL + \varepsilon$$

(e) Path Analysis, used to test direct relationships between variables and assess the contribution of each variable to the financing feasibility model; (f) Development of a Financing Feasibility Matrix by combining Financing Risk Management scores and Technology Readiness Level scores; (g) Model validation via the Chi-Square Test. The following is the Financing Feasibility Matrix, derived by combining the Financing Risk Management Score and the Technology Readiness Level score, as shown in the table 1.

Table 1. Category Matrix

Risk Level	Low TRL	Medium TRL	High TRL
Low Risk	Feasible	Highly Feasible	Priority
Medium Risk	Under Consideration	Under Consideration	Highly Feasible
High Risk	Not Feasible	Not Feasible	Conditionally Feasible

The interpretation of the digital readiness findings is consistent with research indicating that digital financial networks can alleviate SME financing constraints (Jun & Ran, 2024), although the present cross-sectional data do not establish a causal mechanism. Business resilience studies further suggest that financial, social, and organizational

resources shape firms' responses to disruption (Brito et al., 2022; Wiatt et al., 2021). Watson (2022) also highlights the importance of examining who benefits from disaster assistance, which supports the need to validate this screening matrix among previously excluded applicants.

RESULTS AND DISCUSSION

The study involved 100 active MSMEs in Banda Aceh that had been in operation for at least two years and had previously accessed formal financing, with the following breakdown: 45 micro enterprises; 38 small enterprises; and 17 medium-sized enterprises. Based on the length of operation, 42 MSMEs have been in business for 2–5 years; 37 MSMEs have been in business for 6–10 years; and 21 MSMEs have been in business for more than 10 years. Based on the type of financing accessed, 56% of MSMEs received financing from banks, 18% from cooperatives, and 26% from fintech lending platforms. These results indicate that the majority of MSMEs still rely on bank financing, but the use of fintech is beginning to increase in line with the development of digital financial services. This phenomenon aligns with a study (Affandi et al., 2024) that found that digitalization contributes to increased access to financing for MSMEs in Indonesia.

Financing Risk Management Variable (X1)

The Financing Risk Management Variable (X1) is shown in the table 2.

Table 2. Financing Risk Management Variable (X1)

Indicator	Mean	SD
Liquidity	4,12	0,68
Income Stability	3,98	0,74
Financing History	4,25	0,63
Average	4,12	0,68

Source: Data Analysis Results (2026)

The research findings show that the Financing Risk Management variable received an average score of 4.12, which falls into the "high" category. The indicator with the highest score was Financing History (4.25), followed by Liquidity (4.12) and Income Stability (3.98). These findings indicate that the majority of MSMEs in Banda Aceh have a relatively good financing track record and are able to meet their payment obligations to financial institutions. A good financing history serves as a positive signal to lenders when assessing a borrower's ability to meet their credit obligations.

From the perspective of Credit Risk Theory, payment history is one of the primary predictors of default risk. The better the payment history, the lower the perceived risk that financial institutions assign to the borrower. Therefore, MSMEs with a good financing history tend to have a greater chance of obtaining follow-on financing. This finding aligns with studies on SME credit access, which show that prior credit quality has a significant influence on financial institutions' financing decisions. Additionally, high liquidity indicators suggest that most SMEs have the ability to maintain business cash flow,

enabling them to meet short-term obligations. This condition is particularly critical for SMEs operating in disaster-prone areas, as liquidity is a key factor determining a business's ability to survive during operational disruptions. These findings are supported by a study on MSME resilience, which states that the ability to manage financial resources is one of the main determinants of business sustainability (Mamulak et al., 2026).

Technology Readiness Level (X2) Variable

The Technology Readiness Level (X2) variable is shown in the table 3.

Table 3. Technology Readiness Level (X2) Variable

Indicator	Mean	SD
Digitization of Record-Keeping	3,89	0,77
Digital Transactions	4,21	0,61
Platform Integration	3,74	0,83
Average	3,95	0,74

Source: Data Analysis Results (2026)

The research results show that the TRL variable has an average score of 3.95, which falls into the "high" category. The highest-scoring indicator is Digital Transactions (4.21). These findings indicate that the majority of MSMEs have adopted various digital technologies—such as QRIS, mobile banking, online marketplaces, and electronic payment apps—in their business operations. This phenomenon indicates an acceleration of digital transformation in Indonesia's MSME sector. Digitalization not only improves transaction efficiency but also generates a digital footprint that financial institutions can use to assess business profiles and financing eligibility.

Recent research has found that the level of digital technology adoption is positively correlated with improved business performance, financial literacy, and access to formal financing sources. More digitally-oriented SMEs tend to have more comprehensive transaction data, thereby reducing information asymmetry between borrowers and lenders (Affandi et al., 2024).

Furthermore, research on technology readiness among Indonesian MSMEs indicates that technological readiness is a key factor in enhancing competitiveness, productivity, and a business's ability to adapt to changes in the business environment (Kadiyono, 2024).

Financing Eligibility Variable (Y)

The Financing Eligibility Variable (Y) is shown in the table 4.

Table 4. Financing Eligibility Variable (Y)

Indicator	Mean	SD
Eligibility Score	4,08	0,71
Risk Level	3,82	0,76
Average	3,95	0,73

Source: Data Analysis Results (2026)

The Eligibility Score indicator received an average score of 4.08, indicating that the majority of MSMEs feel they have met the various basic requirements typically used by

financial institutions in the financing application process. This high score indicates that the responding MSMEs have established business legality, ongoing business activities, and a fairly good business track record. In financing practices, these aspects are crucial components of the credit scoring process used by financial institutions to mitigate financing risks. According to recent research, the completeness of business information and the quality of business administration significantly contribute to MSMEs' chances of accessing formal financing, as they help reduce information asymmetry between business owners and lenders.

The Risk Level indicator had an average score of 3.82, which is the lowest among the other indicators, although it still falls within the "high" category. This finding indicates that some MSMEs still face various business risks that can influence financing decisions, particularly risks related to market instability, changes in consumer demand, and the impact of natural disasters that could potentially disrupt business operations. This situation is quite understandable given that the study was conducted in Banda Aceh, which has a relatively high level of disaster vulnerability compared to other regions in Indonesia. Consequently, financial institutions tend to pay special attention to MSMEs' ability to manage business risks before extending financing.

Research on business resilience indicates that the ability to manage risks is one of the key factors determining the success of MSMEs in obtaining and maintaining access to formal financing. High business risks increase the perception of credit risk and lower the level of financing eligibility (Riswandi et al., 2024).

Validity and Reliability Tests

Table 5. Construct Validity Test

Variable	Indicator	Loading Factor	Description
Financing Risk Management (X1)	Liquidity	0,845	Meets Construct Validity Criteria
	Income Stability	0,812	
	Financing History	0,884	
Technology Readiness Level (X2)	Digitization of Records	0,876	Meets Construct Validity Criteria
	Digital Transactions	0,851	
	Platform Integration	0,852	
Financing Feasibility (Y)	Credit Score	0,891	Meets Construct Validity Criteria
	Risk Level	0,864	

Source: Data Analysis Results (2026)

The test results show that all indicators have loading factors above 0.70 and a composite reliability value above 0.80 (Table 5). This indicates that all indicators are able to consistently explain the latent construct being measured. Methodologically, high factor loadings indicate that indicators such as liquidity, revenue stability, digitization of record-keeping, digital transactions, and platform integration make a strong contribution to the research construct.

Table 6. Reliability Test

Variable	Cronbach Alpha	Composite Reliability
Financing Risk	0,845	0,901
TRL	0,871	0,915

Financing Feasibility	0,826	0,892

Source: Data Analysis Results (2026)

Constructs with factor loadings >0.70 and composite reliability >0.70 indicate good convergent validity and internal reliability, making them suitable for use in structural equation modeling. Thus, the instruments used in this study meet the measurement standards for quantitative research and are reliable for explaining the phenomenon of MSME financing feasibility (Table 6).

Factor Analysis

Table 7. Kaiser-Meyer-Olkin (KMO)

KMO Value	**Interpretation**
0,836	Excellent

Source: Data Analysis Results (2026)

Table 8. Bartlett's Test

Chi Square	**Sig**
763,214	$p < 0.001$

Source: Data Analysis Results (2026)

A KMO value of 0.836 indicates that the research sample is adequate for factor analysis. Meanwhile, Bartlett's Test yielded a p-value below 0.001, indicating sufficient correlation among the indicators (Table 7 and 8). These findings suggest that the indicators used in the study have strong conceptual relationships and are capable of forming the constructs of Financing Risk Management, Technology Readiness Level, and Financing Feasibility.

Theoretically, these results suggest that financing risk and technology readiness are not standalone concepts but rather interrelated dimensions in determining MSMEs' ability to access financing. Research on digital transformation readiness among SMEs has also found that business resilience and technology readiness are closely linked in shaping business competitiveness (Amalia et al., 2024).

Regression Analysis

The regression equation for this study is as follows:

$$Y = 1.124 + 0.462(X1) + 0.381(X2)$$

Notes:
Y = Financing Eligibility
X1 = Financing Risk Management
X2 = Technology Readiness Level

The regression results show that Financing Risk Management has a coefficient of 0.462 with a significance level of $p < 0.001$. These results demonstrate that the better an SME's ability to manage financing risks, the higher its level of financing eligibility.

This finding can be explained through the perspective of Risk Management Theory, which states that the ability to identify, evaluate, and control risks increases the probability of business success and reduces the likelihood of default. In the context of disaster-affected MSMEs, the ability to maintain liquidity and income stability is a critical factor because these two aspects determine a business's ability to survive during economic or operational disruptions. These research results are consistent with studies showing that business resilience and the ability to manage risk are key determinants of credit access and business sustainability for MSMEs in Indonesia.

The research results indicate that TRL has a coefficient of 0.381 with a significance level of $p < 0.001$. This means that the higher the level of an MSME's technological readiness, the greater its chances of obtaining financing. This finding suggests that financial institutions are beginning to consider digitalization as an indicator of business quality. The use of financial apps, digital transactions, and marketplaces generates more transparent operational data, thereby helping financial institutions conduct more accurate risk assessments.

Digital adoption has a significant impact on improving business performance and financial literacy among MSMEs. Digitalization also helps financing institutions obtain real-time business information, thereby reducing uncertainty in financing decision-making (Affandi et al., 2024). Technology readiness enhances the ability of MSME operators to manage their businesses and improve their financial performance (12).

T-Test

Table 9. T-Test

Variable	Beta	t value	Sig
Financing Risk	0,462	5,813	$p < 0.001$
TRL	0,381	4,924	$p < 0.001$

Source: Data Analysis Results (2026)

Based on table 9, the results show that:

H1: Financing Risk Management has a positive effect on Financing Feasibility. Accepted.

H2: Technology Readiness Level has a positive effect on Financing Feasibility. Accepted.

These findings support recent research indicating that the ability to manage risk and the technology readiness level play a crucial role in improving access to financing and the sustainability of MSMEs (Riswandi, 2024).

F-Test

Table 10. F-Test

F value	Sig
48,327	$p < 0.001$

Source: Data Analysis Results (2026)

Test of the Coefficient of Determination

Table 11. Test of the Coefficient of Determination

R^2	Adjusted R^2
0,612	0,604

Source: Data Analysis Results (2026)

Table 10 showed that 61.2% of the variation in Financing Feasibility can be explained by Financing Risk Management and Technology Readiness Level. The remaining 38.8% is explained by other factors outside the model. The R^2 value of 0.612 indicates that 61.2% of the variation in Financing Feasibility can be explained by Financing Risk Management and Technology Readiness Level (Table 11).

This value falls into the moderate-to-strong category in social and business research. These findings indicate that the two variables used have been able to explain most of the variation in MSME financing feasibility decisions. However, there remains 38.8% of variation influenced by factors outside the model.

These factors likely include: (a) business owner characteristics; (b) managerial capacity; (c) collateral; (d) economic conditions; (e) government support; (f) post-disaster resilience. Recent research also indicates that environmental factors, government support, and organizational adaptability play a significant role in the success of MSMEs in accessing financing and sustaining their businesses (Talahi & Ie, 2024).

Path Analysis

Table 12. Path Analysis

Relationship	Coefisien
Risk → Feasibility	0,462
TRL → Feasibility	0,381

Source: Data Analysis Results (2026)

The table 12 shows that Financing Risk Management has a greater influence than the Technology Readiness Level in determining the feasibility of MSME financing. This indicates that financial institutions still prioritize risk mitigation capabilities as the primary factor in financing decisions, even though the aspect of digitalization is receiving increasing attention. These findings are consistent with a study on the resilience and digital transformation of Indonesian MSMEs (Talahi & Ie, 2024).

Financing Feasibility Model Matrix

Table 13. Risk- and TRL-Based Financing Feasibility Matrix

Risk Level	Low TRL	TRL: Moderate	High TRL
Low Risk	Feasible	Highly Recommended	Financing Priority
Moderate Risk	Under Consideration	Recommended	Highly Feasible
High Risk	Not Feasible	Worth Considering	Conditionally Feasible

Source: Data Analysis Results (2026)

Table 14. Distribution of MSMEs Based on the Matrix

Category	Total
Funding Priority	28
Highly Eligible	32
Eligible	24
Under Consideration	10
Not Eligible	6

Source: Data Analysis Results (2026)

The table 13 and 14 show that 60% of MSMEs fall into the "Highly Eligible" and "Financing Priority" categories, indicating significant potential for the development of post-disaster MSME financing in Banda Aceh.The resulting model demonstrates that the combination of Financing Risk Management and Technology Readiness Level can produce a more comprehensive classification of financing eligibility compared to the traditional 5C approach.

The novelty of this model lies in the integration of two important dimensions that have rarely been combined in SME financing assessments: (a) business resilience through risk management; (b) digital readiness through TRL. Unlike conventional 5C-focused screening, the matrix jointly operationalizes risk-management and digital-readiness dimensions; it should complement rather than replace lender-specific underwriting criteria.This model is relevant to developments in the digital finance industry, which is increasingly utilizing digital data as the basis for credit scoring. In fact, recent studies on credit risk modeling show that the use of digital data can improve the accuracy of SME financing risk assessments compared to conventional methods (14). Thus, the model developed in this study has the potential to serve as an alternative for banks, fintech companies, and credit unions in assessing the financing eligibility of disaster-affected SMEs in a more objective, adaptive, and sustainable manner (Karimova, 2024). Its application outside Banda Aceh would require validation with independent samples, region-specific disaster exposure, and local financial and digital-infrastructure conditions.

Chi-Square Test of the Model

Table 15. Chi-Square Test of the Model

Chi-Square Value	*Sig*
6,284	0,392

Source: Data Analysis Results (2026)

Since the p-value is greater than 0.05 (Table 15), the model is deemed to fit the data and can be used as a tool for assessing the financing feasibility of MSMEs. The regression results ($Y = 1.124 + 0.462X_1 + 0.381X_2$, $R^2 = 0.621$) show that both financing risk management ($\beta = 0.462$, $p < 0.001$) and technology readiness level ($\beta = 0.381$, $p < 0.001$) are significant, positive predictors of financing feasibility, with risk management exerting the stronger influence. This ordering is consistent with credit risk theory, explained that lenders price a borrower primarily on the probability of default and payment history, the highest loading indicator in this study (0.884) is the most direct proxy for that probability available to a financial institution. Technology readiness, by contrast, functions as a secondary, enabling signal: it does not itself guarantee repayment capacity, but it

improves the legibility of a business's cash flow to a lender, which is why its effect, though significant, is smaller in magnitude. Technology adoption has a significant and positive link to MSME performance, but extends that funding by showing that in a financing eligibility context specifically, risk management capability still outweighs technological capability as a determinant (Riswandi, 2024).

The dominance of financing history and liquidity within the risk management construct is not incidental to this study's setting. In a disaster exposed economy such as Banda Aceh, liquidity is not merely the interval between a shock and the resumption of normal cash flow. The comparatively lower score on income stability is worth noting rather than glossing over. It suggests that even MSMEs with strong repayment records and liquidity buffers experience revenue volatility tied to disaster exposure, meaning a lender relying only on the aggregate risk management score could still be exposed to income shock risk that the composite indicator partially masks.

The digital transaction indicator scored highest within the TRL construct, ahead of digitization of record keeping and platform integration. MSMEs are transacting digitally faster than they are formalizing digital record keeping. That gap matters because it is the record keeping dimension, not transaction volume, that actually reduces information asymmetry for a lender doing underwriting. This is broadly consistent with Affandi et al. (2024), whose national survey of 5,035 Indonesian ultra-micro, micro, and small enterprises links digital adoption to business performance and financial literacy. However, the present data suggest the underwriting mechanism is not yet fully realized in Banda Aceh, the platforms and transactions are ahead of the bookkeeping infrastructure that lenders would need in order to actually use TRL as an underwriting input. This is a substantive limitation that should be stated plainly rather than implied optimistically.

The two-dimensional risk x TRL matrix, and the finding that 60% of surveyed MSMEs fall into the "Highly Eligible" or "Financing Priority" categories, extends a broader shift already visible in the Indonesian credit-risk governance literature toward multi dimensional underwriting frameworks. Satriyono (2025) documents that Indonesian MSME credit risk research is increasingly integrating enterprise risk management, ESG indicators and digital capability into a single framework rather than treating each dimension in isolation. The model proposed here is a narrower, two factor version of that same trend, adapted to a disaster exposure context. This is a useful contribution, but should be framed as the first application of this specific risk TRL pairing to disaster affected MSMEs, rather than as a general claim of novelty in multi dimensional credit scoring, which is already an active area of research.

Given the disaster exposure setting, plausible omitted factors specific to post-disaster credit markets include collateral substitues after asset loss, access to government disaster relief guarantee schemes and informal lending relationships that substitute for formal credit history in the immediate aftermath of a shock. For financial institutions, the findings suggest that a two factor screening tool combining risk history and digital footprint could plausibly pre sort MSME applicaitons faster than the conventional 5C approach, particularly for triage purposes. The model's practical readiness should not be overstated, however a Chi-Square goodness of fit test with $p= 0.392$ indicated the model is not rejected by the data, which is a materially weaker claim than the model is validated.

The limitations of this research include purposive sampling of 100 MSMEs already engaged with formal financial institution structurally excludes disaster affected business that were rejected for financing or never applied, which is the population most relevant to a financing feasibility model. In addition, the cross sectional design cannot establish

whether risk management and TRL causally improve feasibility or whether prior access to credit enabled the liquidity and digital invesment measured as predictors.

Qualitative integration and reporting limitation. Although interviews and focus group discussions are described in the methods, the current manuscript does not report participant counts, interview dates, analytic procedures, quotations, themes, or a joint display linking qualitative findings to the regression and matrix results. These results cannot be reconstructed from the available manuscript. The authors should insert verified themes, supporting anonymized quotations, and an explicit explanation of how each theme corroborates, qualifies, or contradicts the quantitative findings before claiming that the sequential explanatory mixed-methods design has been fully reported.

The proposed contribution is a context-specific pairing of financing-risk management and operational digital readiness in an exploratory screening matrix for disaster-exposed MSMEs, rather than a claim to invent multidimensional credit assessment. This exploratory framework may inform discussions among lenders, MSME support agencies, and policymakers, but the present evidence does not demonstrate improved credit decisions or justify deployment. Future studies should test the matrix on independent samples including unsuccessful applicants and non-applicants, and compare its predictive performance against established underwriting approaches (Satriyono, 2025; Affandi et al., 2024).

CONCLUSION

This study found positive statistical associations between Financing Risk Management and the operational technology-readiness measure and perceived financing feasibility among 100 purposively selected MSMEs in Banda Aceh. These results reinforce the argument that SME financing models in disaster-prone areas cannot rely solely on the 5C approach but must also consider the level of technology readiness and the ability to manage business risks. These findings are consistent with recent research showing that the adoption of digital technology, readiness for digital transformation, and business resilience are closely linked to access to financing and the sustainability of SMEs.

ACKNOWLEDGMENT

Researchers would like to express their sincere gratitude to the Ministry of Education and Culture, DRPM, and LLDIKTI Region 13 for funding this research through the 2026 Beginner Lecturer Research Grant under Contract No. 292/C3/DT.05.00/PL-BARU/2026 and Subcontract No. 71/LL13/AL.04/AKA.PL/2026.

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