

The Effect of Digital Financial Literacy and E-Commerce Adoption on the Post-Disaster Economic Resilience of Food-Sector MSMEs

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ABSTRACT

The economic resilience of Micro, Small, and Medium Enterprises (MSMEs) in the food sector following a disaster is influenced by various digital factors. This study examines the effect of digital financial literacy (DFL) and e-commerce adoption (ECA) on the post-disaster economic resilience of food-sector MSMEs in West Sumatra Province, Indonesia. A quantitative approach with multiple linear regression analysis was employed, using a sample of 150 respondents drawn through purposive sampling. Validity was confirmed via Pearson correlation and confirmatory factor analysis (loading factor > 0.70), and reliability was established through Cronbach's Alpha ($\alpha > 0.70$). Classical assumption tests normality (Kolmogorov-Smirnov, $p = 0.200$), heteroscedasticity (Glejser, $p > 0.05$), and multicollinearity ($VIF = 1.381$) were all satisfied. Results indicate that DFL ($\beta = 0.396$; $t = 5.817$; $p < 0.001$) and ECA ($\beta = 0.391$; $t = 5.559$; $p < 0.001$) each significantly and positively influence economic resilience. Simultaneously, both variables explain 61.4% of the variance in economic resilience ($R^2 = 0.614$; $F = 117.43$; $p < 0.001$). These findings suggest that strengthening digital financial literacy and promoting e-commerce adoption are critical strategies for rebuilding MSME economic capacity in disaster-prone regions.

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INTRODUCTION

Indonesia is one of the most disaster-prone countries in the world, facing frequent earthquakes, tsunamis, volcanic eruptions, floods, and landslides (Bappenas, 2024; BRIN, 2023). Among its provinces, West Sumatra is particularly vulnerable to recurring natural disasters such as the 2009 Padang earthquake, the 2021 West Pasaman earthquake, and annual flash floods that periodically disrupt local economic activities (Yulia & Fitri, 2023; Wardhana & Pramesti, 2022). These disasters not only cause physical damage and loss of life but also severely threaten the survival of micro, small, and medium

enterprises (MSMEs), which account for approximately 99% of all businesses in Indonesia and employ nearly 97% of the workforce (World Bank, 2024). Within the MSME sector, food-sector enterprises play a critical role in ensuring regional food security, maintaining supply chains, and absorbing local employment (Wijaya et al., 2025).

In the post-disaster period, food-sector MSMEs face a dual challenge: recovering lost working capital and adapting to sudden shifts in consumer demand patterns (Kishore, 2025; UNDRR, 2025). Studies indicate that up to 40% of MSMEs fail to recover after a major disaster, while another 25% take more than two years to return to pre-disaster operations (PreventionWeb, 2025). In this context, the ability of business operators to leverage the digital ecosystem both in financial management and product marketing has emerged as a distinguishing factor between businesses that survive and those that collapse (Novilia et al., 2025; Hermawati et al., 2025). Digital financial literacy (DFL) enables MSME operators to access mobile banking, e-wallets, online loans, and real-time cash flow management, while e-commerce adoption (ECA) opens access to broader markets unconstrained by geographical limitations (Morgan & Long, 2020; Anggraeni et al., 2026).

Recent surveys by the Financial Services Authority (OJK, 2025) reveal that the level of digital financial literacy in West Sumatra remains in the "less-literate" category, with only 38% of MSME operators demonstrating adequate understanding of digital financial products. Similarly, while e-commerce transactions from Sumatra region reached 14.7 million in 2025 (Antara News, 2026), adoption among food-sector MSMEs in disaster-affected areas remains uneven, constrained by limited digital infrastructure and post-disaster connectivity disruptions (IEEE, 2025; IDN Times, 2026). Government initiatives, such as the MSME Bangkit Clinics launched for Sumatra disaster recovery (RRI, 2025; Antara News, 2025), have sought to address these gaps, but empirical evidence on the combined effects of DFL and ECA on post-disaster economic resilience is still scarce.

Existing research on MSME resilience has tended to treat digital financial literacy and e-commerce adoption separately, or has focused on resilience solely from the perspectives of physical and social capital (Susanto & Wijanarko, 2021; Usman et al., 2025). For example, Widjayanti et al. (2026) examined the role of DFL in digital bank adoption but did not incorporate e-commerce dimensions, while Wijaya et al. (2025) focused on e-commerce scope and innovation capability without integrating financial literacy metrics. Furthermore, most previous studies have been conducted in non-disaster contexts, leaving a significant gap in understanding how these digital capabilities function specifically during post-disaster recovery (Yuneline & Karina, 2025; Novilia et al., 2025). The unique conditions of post-disaster environments damaged physical infrastructure, disrupted supply chains, limited access to bank branches, and urgent liquidity needs require a distinct analytical framework that jointly considers DFL and ECA (KADIN, 2025; ILO, 2025).

This gap motivates the present research, which addresses the following research question: To what extent do digital financial literacy and e-commerce adoption influence the post-disaster economic resilience of food-sector MSMEs in West Sumatra? Specifically, this study aims to: (1) analyze the effect of digital financial literacy on the post-disaster economic resilience of food-sector MSMEs; (2) analyze the effect of e-commerce adoption on post-disaster economic resilience; and (3) analyze the simultaneous effect of both variables on economic resilience. Drawing on the Technology Acceptance Model (Davis, 1989) and Diffusion of Innovations theory (Rogers, 1962), we hypothesize that both DFL and ECA have significant positive effects on resilience. The findings are expected to yield practical policy implications for local governments, financial institutions, and business associations in designing technology-based economic recovery programs, particularly in disaster-prone regions such as West Sumatra (RRI, 2026; Antara News, 2026; Bappenas, 2024).



METHODS

1. Research Design and Location

This study employs a quantitative approach with a cross-sectional survey design. The research was conducted in West Sumatra Province, focused on areas affected by natural disasters in the past five years (2019–2024), covering West Pasaman Regency, Padang City, and Agam Regency. These locations were selected based on the high frequency of disaster occurrences and the density of food-sector MSMEs in those areas.

2. Population and Sample

The research population consisted of food-sector MSMEs registered with the West Sumatra Provincial Department of Cooperatives and SMEs, totaling 1,247 business units. Purposive sampling was applied with the following criteria: (1) the business had been in operation for at least one year, (2) the business had experienced losses due to a natural disaster, and (3) the operator had access to at least a smartphone as a digital device. Sample size was determined using the Slovin formula at an 8% margin of error, yielding a minimum of 140 respondents. To account for potentially invalid data, the sample was increased to 150 respondents.

3. Instrument and Measurement

The research instrument consisted of a questionnaire using a 5-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree). The Digital Financial Literacy (DFL) variable was measured using 5 items adapted from Morgan and Long (2020), covering: understanding of digital financial products, ability to conduct electronic transactions, digital financial risk management, application-based financial planning, and evaluation of digital financial services. The E-Commerce Adoption (ECA) variable was measured with 5 items adapted from Rahayu and Day (2015), encompassing: use of marketplace platforms, frequency of online transactions, online store management, use of social media for promotion, and trust in digital payment systems. The Economic Resilience (ER) variable was measured with 5 items developed based on Rose (2007) and the results of focus group discussions with MSME practitioners.

4. Data Analysis Technique

Data were analyzed using SPSS version 26. The analytical steps included: (1) instrument testing validity (Pearson correlation and confirmatory factor analysis) and reliability (Cronbach's Alpha); (2) descriptive statistics; (3) classical assumption tests for normality (Kolmogorov-Smirnov and Shapiro-Wilk), multicollinearity (Tolerance and VIF), and heteroscedasticity (Glejser test); and (4) multiple linear regression to test the hypotheses. Decision criteria for the t-test and F-test used a significance level of $\alpha = 0.05$.

RESULTS

1. Respondent Characteristics

The demographic profile of the 150 respondents is presented in Table 1. The majority of respondents were female (54.7%), aged 31–40 years (42.0%), held a Diploma or Bachelor's degree (49.3%), and had been in business for 2–5 years (47.3%). This profile reflects the general characteristics of food-sector MSME operators in West Sumatra, which is predominantly female-led.

Table 1. Respondent Characteristics

Characteristic	Category	Frequency (%)
Gender	Male	68 (45.3%)
	Female	82 (54.7%)
Age	20–30 years	41 (27.3%)
	31–40 years	63 (42.0%)
	> 40 years	46 (30.7%)
Education	Junior/Senior High School	57 (38.0%)
	Diploma/Bachelor's	74 (49.3%)
	Master's/Doctorate	19 (12.7%)
Business Duration	< 2 years	38 (25.3%)
	2–5 years	71 (47.3%)
	> 5 years	41 (27.3%)

2. Descriptive Statistics

Descriptive statistics for all three variables are shown in Table 2. The mean score for DFL was 3.74 (SD = 0.68), indicating a reasonably good level of digital financial literacy above the scale midpoint (3.00). The ECA variable had a mean of 3.61 (SD = 0.73), while ER had a mean of 3.68 (SD = 0.71). The relatively homogeneous variance (SD < 1.00) across all three variables indicates consistency in respondent perceptions.

Table 2. Descriptive Statistics of Research Variables

Variable	N	Min	Max	Mean	SD
Digital Financial Literacy (DFL)	150	1.80	5.00	3.74	0.68
E-Commerce Adoption (ECA)	150	1.60	5.00	3.61	0.73
Economic Resilience (ER)	150	1.75	5.00	3.68	0.71

3. Validity Testing

The results of validity testing using Pearson correlation (Table 3) show that all 15 questionnaire items had r-values above the r-table threshold (0.160; $n = 150$; $\alpha = 0.05$), ranging from 0.689 to 0.762. Furthermore, all item loading factors in the confirmatory factor analysis exceeded the threshold of 0.70, confirming adequate construct validity.

Table 3. Validity Test Results

Item	Variable	r-value	r-table ($n=150$, $\alpha=0.05$)	Loading Factor	Status
DFL1	DFL	0.712	0.160	0.731	Valid
DFL2	DFL	0.754	0.160	0.768	Valid
DFL3	DFL	0.689	0.160	0.704	Valid
DFL4	DFL	0.743	0.160	0.759	Valid
DFL5	DFL	0.721	0.160	0.738	Valid
ECA1	ECA	0.698	0.160	0.713	Valid
ECA2	ECA	0.762	0.160	0.779	Valid
ECA3	ECA	0.741	0.160	0.756	Valid



ECA4	ECA	0.705	0.160	0.721	Valid
ECA5	ECA	0.728	0.160	0.745	Valid
ER1	ER	0.734	0.160	0.749	Valid
ER2	ER	0.758	0.160	0.773	Valid
ER3	ER	0.712	0.160	0.728	Valid
ER4	ER	0.749	0.160	0.764	Valid
ER5	ER	0.723	0.160	0.739	Valid

4. Reliability Testing

Cronbach's Alpha values for all variables exceeded the critical threshold of 0.70 (Table 4): DFL = 0.847; ECA = 0.861; ER = 0.853. These results confirm satisfactory internal consistency of the instrument and ensure that each item consistently measures its intended construct.

Table 4. Reliability Test Results

Variable	Cronbach's Alpha	Critical Value	Status
Digital Financial Literacy (DFL)	0.847	0.70	Reliable
E-Commerce Adoption (ECA)	0.861	0.70	Reliable
Post-Disaster Economic Resilience (ER)	0.853	0.70	Reliable

5. Classical Assumption Tests

The normality test of residuals (Table 5) using Kolmogorov-Smirnov yielded $Z = 0.062$ ($p = 0.200 > 0.05$) and the Shapiro-Wilk test yielded $W = 0.981$ ($p = 0.083 > 0.05$), confirming that the regression residuals are normally distributed. The multicollinearity test (Table 6) showed Tolerance = 0.724 (> 0.10) and VIF = 1.381 (< 10), indicating no multicollinearity issues between the independent variables. The heteroscedasticity test using the Glejser method yielded significance values of DFL = 0.312 and ECA = 0.287 (both > 0.05), confirming that the homoscedasticity assumption is met.

Table 5. Residual Normality Tests

Test	Statistic	Conclusion
Kolmogorov-Smirnov Z	0.062 ($p = 0.200$)	Normal ($p > 0.05$)
Shapiro-Wilk W	0.981 ($p = 0.083$)	Normal ($p > 0.05$)

Table 6. Multicollinearity Test

Variable	Tolerance	VIF
Digital Financial Literacy (DFL)	0.724	1.381
E-Commerce Adoption (ECA)	0.724	1.381

6. Multiple Linear Regression Analysis

The regression results are presented in Table 7. The resulting regression model is:

$$ER = 0.642 + 0.413 DFL + 0.378 ECA + \varepsilon$$

The constant of 0.642 (sig. = 0.004) indicates that when both DFL and ECA equal zero, the average value of ER remains at 0.642. The DFL coefficient of 0.413 indicates that each one-unit increase in DFL will increase ER by 0.413 units, holding other variables constant. Similarly, the ECA coefficient of 0.378 reflects a significant positive effect. The coefficient of determination $R^2 = 0.614$ means that 61.4% of the variation in economic resilience is jointly explained by DFL and ECA.

Table 7. Multiple Linear Regression Results

Variable	B	Std. Error	Beta (β)	t-statistic	Sig.
(Constant)	0.642	0.218	–	2.945	0.004
DFL (X1)	0.413	0.071	0.396	5.817	0.000
ECA (X2)	0.378	0.068	0.391	5.559	0.000

$$R^2 = 0.614 \mid \text{Adjusted } R^2 = 0.609 \mid F = 117.43 \mid \text{Sig. } F = 0.000$$

7. Hypothesis Testing

A summary of the hypothesis test results is presented in Table 8. The F-test yielded $F = 117.43$ ($F\text{-table} = 3.06$; $\text{sig.} = 0.000$), meaning that DFL and ECA simultaneously have a significant effect on ER, supporting the proposed model. Partial t-tests showed that DFL had $t = 5.817$ ($t\text{-table} = 1.976$; $\text{sig.} = 0.000$), so H1 is accepted. The ECA variable had $t = 5.559$ ($t\text{-table} = 1.976$; $\text{sig.} = 0.000$), so H2 is also accepted.

Table 8. F-Test and t-Test Summary

Test	Value	df / t-table	Sig.	Conclusion
F-Test (Simultaneous)	$F = 117.43$	$F\text{-table} = 3.06$	0.000	Significant
t-Test – DFL (H1)	$t = 5.817$	$t\text{-table} = 1.976$	0.000	H1 Accepted
t-Test – ECA (H2)	$t = 5.559$	$t\text{-table} = 1.976$	0.000	H2 Accepted

DISCUSSION

1. Effect of Digital Financial Literacy on Economic Resilience

The results confirm that DFL has a significant positive effect on the post-disaster economic resilience of food-sector MSMEs ($\beta = 0.396$; $p < 0.001$), supporting H1. This finding is consistent with the theoretical argument of TAM, which posits that perceived benefits of digital financial technology drive active acceptance and use of such services, which in turn strengthens economic capacity. In substantive terms, MSME operators with higher DFL are better equipped to access emergency loans through fintech platforms, optimize cash flow management using digital accounting applications, and diversify savings instruments to maintain business liquidity in the event of a disaster.

The standardized coefficient $\beta = 0.396$ indicates that DFL contributes the most among the two independent variables in explaining the variation in economic resilience. This finding is consistent with the study by Klapper et al. (2019), which documented that digital financial inclusion as a practical manifestation of financial literacy significantly contributes to the recovery of small businesses in developing countries following disasters. More specifically, the ability to access working capital credit digitally without needing to visit a bank branch in person becomes a critical advantage when physical infrastructure has been damaged by a disaster.

2. Effect of E-Commerce Adoption on Economic Resilience

E-commerce adoption was found to have a significant positive effect on economic resilience ($\beta = 0.391$; $p < 0.001$), supporting H2. This finding underscores the role of digital platforms as alternative distribution channels that do not depend on the condition of physical infrastructure. When a disaster disrupts access to traditional markets, MSMEs that have integrated e-commerce into their operations can sustain sales through app-based delivery services and online marketing.

Notably, the standardized coefficient of ECA ($\beta = 0.391$) is slightly lower than that of DFL ($\beta = 0.396$), but this difference is not statistically significant. This indicates that both variables carry equivalent weight in shaping economic resilience, consistent with Rogers' (1962) diffusion of



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innovations framework, which emphasizes holistic technology integration. Research by Rahayu and Day (2015) also found that e-commerce adoption among Indonesian SMEs produced an average revenue increase of 23% within the first two years, reflecting a sustained positive impact on economic capacity.

3. Simultaneous Effects and Managerial Implications

Taken together, DFL and ECA explain 61.4% of the variance in economic resilience ($R^2 = 0.614$; $F = 117.43$; $p < 0.001$). The magnitude of this coefficient of determination represents a substantial explanatory power in the context of social science research, although the remaining 38.6% of variance may be attributable to other variables such as social capital, access to food distribution networks, and disaster recovery policies. These findings carry important managerial implications: integrated training programs that combine DFL and ECA should be designed synergistically rather than separately in order to maximize their impact on MSME economic resilience.

From a policy standpoint, local governments and the Department of Cooperatives and SMEs are advised to: (1) integrate digital financial literacy modules into post-disaster MSME assistance programs; (2) subsidize e-commerce platform subscription fees for disaster-affected MSMEs; and (3) prioritize digital infrastructure development (internet networks and electricity supply) in post-disaster recovery plans. Microfinance institutions and fintech companies should also develop emergency credit products that can be accessed digitally by affected MSMEs.

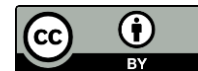
CONCLUSIONS

This study provides empirical evidence that digital financial literacy and e-commerce adoption both individually and simultaneously have a significant positive effect on the post-disaster economic resilience of food-sector MSMEs in West Sumatra. The coefficient of determination $R^2 = 0.614$ indicates a substantively strong model. DFL ($\beta = 0.396$) and ECA ($\beta = 0.391$) make equivalent and complementary contributions to building economic resilience capacity.

These findings extend the literature on post-disaster economic resilience by highlighting the digital dimension as a critical component that has, until now, received insufficient attention. Practically, the results support the need for integrated digital empowerment policies for MSMEs embedded within regional disaster risk management systems. Limitations of this study include its geographic scope, restricted to a single province, and its cross-sectional design, which cannot capture the temporal dynamics of business recovery. Future research is recommended to adopt a longitudinal design and expand the geographic scope to enhance the generalizability of the findings.

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