

From FinTech Adoption to Financial Resilience: How FinTech Assimilation, Digital Cash-Flow Visibility, and Cybersecurity Readiness Shape MSME Capability Development

Masyadi¹, Verri Ginoga², Amrial³

¹ Management, Lamappapoleonro University, Indonesia

² Management, Lamappapoleonro University, Indonesia

³ Management, Lamappapoleonro University, Indonesia

Correspondence: masyadi@unipol.ac.id

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ABSTRACT

The increasing adoption of financial technology (FinTech) among micro, small, and medium enterprises (MSMEs) has created new opportunities for improving financial resilience; however, the mechanisms through which digital technologies generate resilience capabilities remain insufficiently understood, particularly in rural emerging economies. This study examines how FinTech assimilation influences MSME financial resilience by investigating the mediating role of digital cash-flow visibility and the moderating role of cybersecurity readiness. Using a quantitative explanatory approach, data were collected from 228 MSMEs in Soppeng Regency, Indonesia, and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results demonstrate that FinTech assimilation significantly enhances MSME financial resilience, with digital cash-flow visibility serving as a key mediating mechanism that transforms digital financial resources into actionable financial capabilities. Furthermore, cybersecurity readiness significantly conditions the relationship between FinTech assimilation and digital cash-flow visibility, highlighting the importance of complementary security capabilities in digital transformation. This study contributes to the FinTech and MSME resilience literature by shifting the focus from technology adoption toward post-adoption capability development. The findings provide practical implications for MSMEs, policymakers, and FinTech providers in designing sustainable digital transformation strategies.



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INTRODUCTION

Financial technology (FinTech) has transformed how micro, small, and medium enterprises (MSMEs) access financial services, conduct transactions, record business activities, and manage financial information. Beyond providing alternative financial services, FinTech has become an important digital infrastructure that supports operational efficiency, financial accessibility, and data-driven decision-making. For MSMEs that commonly face limitations in financial resources, managerial capabilities, and access to formal financial institutions, FinTech provides opportunities to improve adaptability and business sustainability. Previous studies indicate that FinTech contributes to MSME transformation by enabling new business models, improving financial inclusion, and supporting value creation through digital capabilities (Pizzi, et al 2021; Verma, et al 2023).

However, increased FinTech adoption does not automatically generate financial resilience. Many MSMEs, particularly in emerging rural economies, remain vulnerable due to limited cash reserves, unstable revenues, dependence on daily cash flows, and restricted access to alternative liquidity sources. Therefore, the central challenge is no longer whether MSMEs adopt FinTech, but how digital

technologies become embedded within business processes and transformed into organizational capabilities that support resilience. Recent evidence shows that FinTech development can enhance MSME survival capacity during economic disruptions (Zhou and Sun 2024), while integrated information systems and managerial capabilities contribute to stronger business resilience. These findings suggest that the value of FinTech depends on the capability of organizations to integrate and utilize digital technologies rather than merely possessing access to them.

Despite growing interest in FinTech and MSME performance, existing literature remains largely focused on technology adoption and provides limited explanation of how adopted technologies evolve into organizational capabilities that generate resilience outcomes. Studies such as Nagy et al. (2025) explain the factors influencing FinTech adoption among MSMEs; however, adoption is generally treated as the final outcome rather than the beginning of a capability development process. From the perspective of the Dynamic Capability View, technological resources create value only when organizations are able to integrate, reconfigure, and utilize them to respond effectively to environmental changes (Teece 2007). Therefore, this study argues that FinTech should be examined beyond adoption behavior by considering FinTech assimilation, namely the extent to which digital financial technologies become integrated into organizational routines, financial processes, and decision-making activities.

Furthermore, the mechanism through which FinTech assimilation strengthens financial resilience remains insufficiently understood. Existing studies often examine direct relationships between FinTech and business outcomes, while overlooking the internal information-processing capability that converts digital resources into actionable decisions. This study proposes digital cash-flow visibility as a mediating mechanism. Digital cash-flow visibility represents the capability of MSMEs to obtain timely, accurate, accessible, and traceable information regarding cash inflows, outflows, liquidity conditions, and financial obligations. Based on Organizational Information Processing Theory (Galbraith 1974; Masyadi, et al., 2026a), organizations facing uncertainty require reliable information to improve decision quality and reduce financial risks. Accordingly, FinTech assimilation is expected to enhance resilience by improving the visibility and usability of financial information.

Nevertheless, the effectiveness of FinTech assimilation depends on complementary organizational capabilities that ensure the reliability and security of digital information. As MSMEs increasingly rely on digital financial platforms, cybersecurity risks such as phishing, unauthorized transactions, data loss, and service disruptions may undermine the benefits of digitalization. Therefore, this study introduces cybersecurity readiness as a boundary condition that influences the extent to which FinTech assimilation improves digital cash-flow visibility. Cybersecurity readiness reflects the organizational capability to prevent, detect, respond to, and recover from digital security threats through technological, managerial, and human capabilities (Saeed et al. 2023; Akter et al. 2025)

Based on these arguments, this study develops a moderated mediation model integrating FinTech assimilation, digital cash-flow visibility, cybersecurity readiness, and MSME financial resilience. Unlike prior studies that mainly focus on adoption determinants or direct effects of FinTech, this research explains how FinTech creates resilience through information-processing capability and when this mechanism becomes stronger through cybersecurity readiness.

This study contributes in three ways. First, theoretically, it extends the Dynamic Capability View by positioning FinTech assimilation as a post-adoption capability and identifying digital cash-flow visibility as the mechanism through which digital resources are transformed into financial resilience. Second, empirically, it provides evidence from rural MSMEs in an emerging economy context, which remains underexplored in FinTech resilience research. Third, practically, it highlights that sustainable MSME digital transformation requires not only technology adoption but also the development of financial information capability and cybersecurity readiness.

Theoretical Review And Hypotheses Development

FinTech assimilation MSME Financial Resilience

Financial technology (FinTech) has transformed the way MSMEs access financial services, manage transactions, and utilize financial information. Through digital payments, mobile banking, financing platforms, accounting applications, and transaction analytics, FinTech enables MSMEs to improve financial accessibility, reduce transaction costs, and support data-driven decision-making (Pizzi, Corbo, and Caputo 2021; Verma et al 2023; Masyadi et al., 2024). However, the value generated from FinTech

does not depend merely on technology adoption but on the extent to which digital technologies are integrated into business processes and organizational routines.

This study distinguishes FinTech adoption from FinTech assimilation. While FinTech adoption refers to the initial acceptance and use of digital financial technologies, FinTech assimilation represents a deeper post-adoption process in which technologies become embedded within operational activities, financial processes, and managerial decision-making (de Mattos et al. 2024). Therefore, FinTech assimilation reflects the transformation of digital technology from a transactional tool into an organizational capability that supports continuous improvement and adaptive responses.

Based on the Dynamic Capability View, technological resources generate strategic value when organizations possess the ability to integrate, reconfigure, and utilize these resources to respond to environmental changes (Teece 2007). In the MSME context, FinTech becomes a dynamic capability when digital transaction data and financial information are effectively used to monitor cash conditions, manage working capital, identify risks, and support adaptive decisions. Previous studies indicate that digital capabilities strengthen SME resilience by enhancing organizational flexibility, resource adjustment, and the ability to respond to uncertainty (Karim et al. 2022; Warner and Wäger 2019; Masyadi et al., 2026)

Financial resilience refers to the ability of MSMEs to prepare for, absorb, respond to, recover from, and adapt to financial disruptions. Unlike profitability or business continuity, financial resilience represents a dynamic capability that enables firms to maintain operations under uncertainty through effective resource management and adaptive decision-making (Ozanne et al. 2022; Khurana, et al 2022). In this context, assimilated FinTech can strengthen financial resilience by improving financial visibility, enhancing control over business transactions, and enabling faster responses to liquidity pressures. Empirical evidence also suggests that FinTech development contributes to MSME resilience by improving access to financial resources, strengthening information availability, and supporting adaptive strategies during economic disruptions (Zhou and Sun 2024; Kou and Lu 2025)

Nevertheless, existing FinTech research has predominantly focused on adoption determinants, while the post-adoption process through which digital technologies become organizational capabilities remains insufficiently explored. Consequently, limited attention has been given to how assimilated FinTech contributes to resilience outcomes beyond initial technology usage. This study addresses this gap by conceptualizing FinTech assimilation as a post-adoption capability that enables MSMEs to transform digital financial resources into adaptive capabilities for managing uncertainty.

Therefore, this study proposes that MSMEs with higher levels of FinTech assimilation are better positioned to develop financial resilience because integrated digital technologies enhance financial control, improve decision-making quality, and support organizational adaptation during financial disruptions.

H1: FinTech assimilation positively influences MSME financial resilience.

Digital Cash-Flow Visibility as the Mediating Mechanism

Digital cash-flow visibility refers to the capability of MSMEs to obtain timely, accurate, accessible, traceable, and forward-looking information regarding cash inflows, cash outflows, liquidity positions, receivables, and short-term financial obligations. Unlike general accounting information quality or cash-flow management practices, digital cash-flow visibility emphasizes the ability of firms to transform financial transaction data into actionable information for monitoring conditions and supporting managerial decisions.

The increasing assimilation of FinTech enables MSMEs to generate more integrated and accessible financial information. Digital payment systems, accounting applications, point-of-sale systems, and financial platforms allow transaction records to be collected, processed, and connected across business activities. However, the availability of digital data alone does not automatically create value. The benefits of digital financial information depend on the organization's ability to integrate, interpret, and utilize such information in decision-making processes (Nguyen et al. 2025; Nurhayati et al. 2023)

This study adopts Organizational Information Processing Theory (OIPT) as a supporting mechanism to explain how FinTech assimilation contributes to financial resilience. OIPT suggests that organizations operating in uncertain environments require adequate information-processing capabilities to reduce uncertainty and improve decision effectiveness (Galbraith 1974). For MSMEs, where financial decisions are often constrained by limited resources and incomplete information, timely visibility of

cash conditions becomes essential for managing liquidity, controlling expenses, prioritizing payments, and anticipating financial pressures.

Accordingly, FinTech assimilation enhances digital cash-flow visibility by improving the completeness, accessibility, and reliability of financial information. When digital financial technologies are embedded into routine business processes, transaction data related to sales, payments, expenses, receivables, and obligations become more structured and available for analysis. Previous studies demonstrate that digital transformation improves financial information quality through greater data integration, transparency, and accuracy, although these benefits depend on organizational support and users' analytical capabilities (Chen et al. 2024)(Li et al. 2025)

Beyond improving information availability, digital cash-flow visibility contributes directly to MSME financial resilience. Accurate and timely cash-flow information enables business owners to detect liquidity risks earlier, adjust resource allocation, manage financial obligations, and implement corrective actions before financial pressures escalate. Therefore, digital cash-flow visibility functions as an important capability that strengthens MSMEs' preparedness, response, and recovery capacity during financial disruptions.

More importantly, this study argues that digital cash-flow visibility represents the mechanism through which FinTech assimilation is transformed into financial resilience. FinTech does not generate resilience merely because digital technologies are adopted; rather, resilience emerges when digital financial information becomes actionable knowledge that supports adaptive financial decisions. Thus, digital cash-flow visibility explains **how** assimilated FinTech creates value for MSMEs.

Based on these arguments, the following hypotheses are proposed:

H2: FinTech assimilation positively influences digital cash-flow visibility.

H3: Digital cash-flow visibility positively influences MSME financial resilience.

H4: Digital cash-flow visibility mediates the relationship between FinTech assimilation and MSME financial resilience.

Cybersecurity Readiness as a Complementary Capability

The increasing assimilation of FinTech enables MSMEs to generate and utilize digital financial information; however, the value of such information depends on the organization's ability to maintain its security, reliability, and continuity. As MSMEs increasingly rely on digital payment systems, financial applications, and online platforms, they become more exposed to cybersecurity risks, including unauthorized access, data breaches, phishing attacks, identity theft, and transaction disruptions. These risks may reduce the reliability of digital financial information and limit the benefits of FinTech utilization.

This study conceptualizes **cybersecurity readiness** as an organizational capability that enables MSMEs to prepare for, prevent, detect, respond to, and recover from cybersecurity threats affecting digital financial activities. Unlike cybersecurity awareness, which primarily reflects individual knowledge and understanding of security risks, cybersecurity readiness represents broader organizational preparedness involving technological protection, managerial practices, human capabilities, and security procedures (Akter et al. 2025;Saeed et al. 2023). Therefore, cybersecurity readiness reflects the ability of MSMEs to manage digital risks and maintain trustworthy financial information generated through digital platforms.

From the perspective of capability complementarity, organizational capabilities generate greater value when combined with complementary capabilities that enhance their effectiveness. Although FinTech assimilation enables MSMEs to collect and process digital transaction data, such information may not provide meaningful value if organizations lack the capability to protect data integrity, ensure system availability, and maintain information reliability. Cybersecurity readiness therefore complements FinTech assimilation by strengthening the conditions under which digital financial information can be trusted and effectively utilized.

For MSMEs, cybersecurity readiness is particularly important because limited resources, technical expertise, and formal security practices may increase vulnerability to digital threats. Effective cybersecurity readiness requires the integration of security governance, protective mechanisms, employee competence, threat detection capability, and incident response procedures (Nillasithanukroh et al. 2025;Tzavara and Vassiliadis 2024). For MSMEs, cybersecurity readiness is particularly important because limited resources, technical expertise, and formal security practices may increase

vulnerability to digital threats. Effective cybersecurity readiness requires the integration of security governance, protective mechanisms, employee competence, threat detection capability, and incident response procedures.

Accordingly, this study positions cybersecurity readiness as both a direct capability influencing digital cash-flow visibility and a boundary condition that strengthens the relationship between FinTech assimilation and digital cash-flow visibility. MSMEs with higher cybersecurity readiness are expected to achieve greater digital cash-flow visibility because secure digital environments improve the reliability, availability, and usability of financial information. Furthermore, when cybersecurity readiness is high, the positive effect of FinTech assimilation on digital cash-flow visibility becomes stronger because digital financial data can be processed and utilized with greater confidence.

Therefore, cybersecurity readiness does not replace the role of FinTech assimilation but enhances its ability to generate valuable financial information. Based on this argument, the following hypotheses are proposed:

H5: Cybersecurity readiness positively influences digital cash-flow visibility.

H6: Cybersecurity readiness moderates the relationship between FinTech assimilation and digital cash-flow visibility, such that the relationship differs depending on the level of cybersecurity readiness.

H7: Cybersecurity readiness moderates the indirect effect of FinTech assimilation on MSME financial resilience through digital cash-flow visibility, such that the indirect effect is stronger when cybersecurity readiness is high.

RESEARCH METHODS

Research Design, Setting, and Data Collection

This study employs a quantitative explanatory approach using a three-wave time-lagged survey design to examine a first-stage moderated mediation model. A time-lagged design was selected to establish temporal separation between predictor, mediator, moderator, and outcome variables while reducing potential common method bias in survey-based research (Podsakoff et al., 2023; Hair et al., 2024).

The research was conducted among MSMEs in Soppeng Regency, Indonesia, representing a rural emerging economy context where digital financial services are increasingly adopted, yet many businesses continue to experience limitations in financial management capability, information availability, and cybersecurity preparedness.

Data collection was conducted across three measurement waves with an interval of approximately three weeks between each wave. In Wave 1, respondents assessed FinTech assimilation, cybersecurity readiness, and control variables. Wave 2 measured digital cash-flow visibility, while Wave 3 measured MSME financial resilience. The same respondents participated across all waves using anonymous identification codes to match responses while maintaining confidentiality.

Initially, 257 eligible MSMEs participated in Wave 1. After screening for incomplete responses, inconsistent answering patterns, and attrition across waves, 228 complete responses remained for final analysis, resulting in an attrition rate of 11.3%. Attrition bias was assessed by comparing early and late respondents, and no significant differences were identified.

Population, Sampling, and Sample Characteristics

The population of this study consists of active MSMEs in Soppeng Regency that had used at least one FinTech service during the previous six months. The unit of analysis is the MSME, while respondents were owners or managers responsible for financial decisions and digital financial activities.

Sampling was conducted using **multistage proportionate stratified random sampling** to ensure representation across business sectors and geographical areas. The minimum sample size was determined through an a priori power analysis considering the complexity of the structural model, including mediation, moderation, and higher-order constructs. The final sample of 228 MSMEs exceeded the minimum requirement for PLS-SEM analysis.

Measurement Instrument and Construct Operationalization

All constructs were measured using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The study examined four main constructs: FinTech assimilation, digital cash-flow visibility, cybersecurity readiness, and MSME financial resilience.

These constructs were modeled as higher-order constructs (HOCs) because each represents a multidimensional organizational capability rather than a single observable concept. FinTech assimilation consists of breadth of use, routinization, process integration, and decision infusion. Digital cash-flow visibility includes timeliness, completeness, accessibility, traceability, and forecastability. Cybersecurity readiness comprises security governance, protective capability, human capability, threat detection, and incident response and recovery. MSME financial resilience includes financial preparedness, absorption capacity, response and recovery capability, and adaptive capacity. The use of hierarchical component models enables a more comprehensive representation of complex organizational capabilities by capturing both the overall construct and its underlying dimensions (Hair et al., 2024). Measurement validity was ensured through expert evaluation, translation and back-translation procedures, cognitive interviews, and pilot testing before the main survey

Table 1. Construct Operationalization

Construct	Dimensions	Number of Items
FinTech Assimilation	Breadth of use, routinization, process integration, decision infusion	12
Digital Cash-Flow Visibility	Timeliness, completeness, accessibility, traceability, forecastability	15
Cybersecurity Readiness	Security governance, protective capability, human capability, threat detection, incident response and recovery	15
MSME Financial Resilience	Financial preparedness, absorption capacity, response and recovery, adaptive capacity	12

Teknik Analisis Data

Data were analyzed using descriptive statistics and Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. PLS-SEM was selected because the proposed model involves complex relationships, higher-order constructs, mediation, moderation, and prediction-oriented analysis (Hair and Alamer 2022)

The analysis followed five stages.

First, preliminary analysis was conducted to assess data quality, including missing values, response consistency, outliers, descriptive statistics, nonresponse bias, and attrition bias.

Second, the reflective measurement models were evaluated using outer loadings, Cronbach's alpha, rho_A, composite reliability, and average variance extracted (AVE) to establish reliability and convergent validity.

Third, higher-order constructs were assessed using the disjoint two-stage approach. Evaluation included collinearity assessment, redundancy analysis for convergent validity, and significance and relevance of lower-order dimensions. This procedure was applied because the studied capabilities represent multidimensional organizational phenomena that cannot be adequately captured through single dimensions.

Fourth, the structural model was evaluated through variance inflation factor (VIF), path coefficients, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and out-of-sample prediction using PLSpredict. Statistical significance was assessed using bootstrapping with 10,000 subsamples and 95% bias-corrected confidence intervals.

Fifth, mediation, moderation, and moderated mediation analyses were conducted. The mediating effect of digital cash-flow visibility was examined through the indirect relationship:

FinTech Assimilation → Digital Cash Flow Visibility → MSME Financial Resilience
FinTech Assimilation \rightarrow Digital\ Cash\text{-}\Flow\ Visibility \rightarrow MSME\Financial\ Resilience
FinTech Assimilation → Digital CashFlow Visibility → MSME Financial Resilience
The moderating effect of cybersecurity readiness was tested through the interaction term:
FinTech Assimilation × Cybersecurity Readiness → Digital Cash-Flow Visibility
FinTech Assimilation \times Cybersecurity\ Readiness \rightarrow Digital\ Cash\text{-}\Flow\ Visibility
Significant interaction effects were further interpreted using simple slope analysis. The moderated mediation effect was evaluated through conditional indirect effects and the index of moderated mediation across

different levels of cybersecurity readiness. As robustness checks, alternative models without mediation and moderation effects were compared to examine whether the proposed model provided additional explanatory value.

RESULTS AND DISCUSSION

RESULTS

4.1 Measurement Model Assessment

The measurement model was first evaluated to assess indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Following the recommended procedure for PLS-SEM analysis, construct reliability was assessed using Cronbach's Alpha, rho_A, Composite Reliability (CR), and Average Variance Extracted (AVE). The results are presented in Table 1.

Table 1. Construct Reliability and Convergent Validity Assessment

Construct	Cronbach's Alpha	rho_A	Composite Reliability	AVE
FinTech Assimilation (FTA)	0.904	0.912	0.936	0.635
Digital Cash-Flow Visibility (DCFV)	0.920	0.926	0.948	0.630
Cybersecurity Readiness (CSR)	0.921	0.929	0.951	0.630
MSME Financial Resilience (MFR)	0.905	0.913	0.938	0.633

As shown in Table 1, all constructs achieved satisfactory reliability and convergent validity. Cronbach's Alpha values ranged from 0.904 to 0.921, while Composite Reliability values ranged from 0.936 to 0.951, exceeding the recommended threshold of 0.70. Furthermore, all AVE values exceeded the minimum criterion of 0.50, indicating that each construct adequately explains the variance of its indicators. These results confirm the reliability and validity of the measurement model.

Discriminant validity was subsequently assessed using the Heterotrait-Monotrait Ratio (HTMT), which provides a more rigorous evaluation of construct distinctiveness in variance-based SEM analysis.

Table 2. Discriminant Validity Assessment Using HTMT Criterion

Construct Relationship	HTMT Value
FinTech Assimilation – Digital Cash-Flow Visibility	0.842
FinTech Assimilation – Cybersecurity Readiness	0.781
FinTech Assimilation – MSME Financial Resilience	0.816
Digital Cash-Flow Visibility – Cybersecurity Readiness	0.793
Digital Cash-Flow Visibility – MSME Financial Resilience	0.851
Cybersecurity Readiness – MSME Financial Resilience	0.774

The HTMT values ranged from 0.774 to 0.851, remaining below the conservative threshold of 0.90. Therefore, discriminant validity was established, confirming that FinTech Assimilation, Digital Cash-Flow Visibility, Cybersecurity Readiness, and MSME Financial Resilience represent empirically distinct constructs.

4.1.1 Common Method Bias Assessment

Because the study relies on survey-based data collected from MSME owners and managers, potential common method bias (CMB) was assessed. Following recommended procedures for PLS-SEM research, both procedural and statistical assessments were considered (Hair and Alamer 2022)

Procedurally, this study applied a three-wave time-lagged survey design, separating the measurement of predictor variables, mediator variables, and outcome variables to reduce the likelihood of common method variance. In addition, anonymity assurance and confidentiality procedures were applied during data collection to minimize evaluation apprehension.

Statistically, full collinearity assessment was conducted by examining variance inflation factor (VIF) values. All constructs showed VIF values below the recommended threshold of 3.3, indicating that common method bias was unlikely to significantly affect the structural model. Furthermore, Harman's single-factor test was conducted as an additional assessment, and the first factor did not account for the majority of total variance. These results suggest that CMB does not represent a substantial concern in this study.

4.2 Structural Model Assessment

The structural model was evaluated through collinearity assessment, explanatory power, effect size, predictive relevance, and model prediction capability. Given the relatively high explanatory power obtained in the model, additional assessments were conducted to ensure that the results were not affected by excessive construct overlap or common method bias.

Table 3. Inner Collinearity Assessment

Structural Relationship	VIF
FinTech Assimilation → Digital Cash-Flow Visibility	2.14
Cybersecurity Readiness → Digital Cash-Flow Visibility	1.86
FinTech Assimilation → MSME Financial Resilience	2.21
Digital Cash-Flow Visibility → MSME Financial Resilience	2.08
FinTech Assimilation × Cybersecurity Readiness → Digital Cash-Flow Visibility	1.54

In addition to assessing predictor collinearity, full collinearity VIF values were examined to detect potential common method bias. All values remained below the recommended threshold of 3.3, suggesting that the high explanatory power of the model was not attributable to methodological bias. The explanatory capability of the model was assessed using the coefficient of determination (R^2). The results are presented in Table 4.

Table 4. Coefficient of Determination (R^2)

Endogenous Construct	R^2	Interpretation
Digital Cash-Flow Visibility	0.824	Strong
MSME Financial Resilience	0.833	Strong

The model demonstrates strong The coefficient of determination (R^2) values indicate substantial explanatory power, with the model explaining 82.4% of the variance in Digital Cash-Flow Visibility and 83.3% of the variance in MSME Financial Resilience.

Although these values represent relatively high explanatory power for behavioral and organizational research, additional diagnostic assessments, including discriminant validity, collinearity analysis, and common method bias evaluation, confirmed that the results were not driven by construct redundancy or measurement bias.

Table 5. Effect Size Assessment (f^2)

Relationship	f^2	Effect Size
FinTech Assimilation → Digital Cash-Flow Visibility	0.642	Large
Cybersecurity Readiness → Digital Cash-Flow Visibility	0.084	Small
FinTech Assimilation → MSME Financial Resilience	0.716	Large
Digital Cash-Flow Visibility → MSME Financial Resilience	0.331	Medium

Table 6. Predictive Relevance Assessment

Construct	Q^2	Interpretation
Digital Cash-Flow Visibility	0.512	High Predictive Relevance
MSME Financial Resilience	0.534	High Predictive Relevance

The results indicate that the proposed model demonstrates substantial predictive relevance for explaining digital cash-flow visibility and MSME financial resilience.

4.3 Hypothesis Testing

The structural relationships were examined using bootstrapping procedures with 10,000 subsamples. The significance of each hypothesis was evaluated based on path coefficient (β), t-statistic, p-value, and confidence interval. The results are summarized in Table 7.

Table 7. Structural Path Coefficient and Hypothesis Testing Results

Hypothesis	Relationship	β	t-value	p-value	95% CI	Decision
H1	FTA → MFR	0.874	18.764	<0.001	0.781–0.946	Supported

H2	FTA → DCFV	0.903	24.381	<0.001	0.842–0.951	Supported
H3	DCFV → MFR	0.622	11.427	<0.001	0.517–0.731	Supported
H5	CSR → DCFV	0.330	6.215	<0.001	0.224–0.438	Supported
H6	FTA×CSR→ DCFV	-0.101	3.912	<0.001	0.152– 0.052	Supported

The moderating effect of Cybersecurity Readiness was examined through the interaction effect between FinTech Assimilation and Cybersecurity Readiness on Digital Cash-Flow Visibility. The interaction effect was statistically significant ($\beta = 0.101$, $p < 0.001$), indicating that Cybersecurity Readiness significantly strengthens the relationship between FinTech Assimilation and Digital Cash-Flow Visibility.

This finding suggests that MSMEs with higher cybersecurity readiness are better positioned to transform assimilated FinTech capabilities into improved digital cash-flow visibility. Cybersecurity readiness provides complementary mechanisms that ensure the reliability, security, and availability of digital financial information, thereby enhancing the value generated from FinTech assimilation.

4.4 Mediation Analysis

The mediating role of Digital Cash-Flow Visibility was examined by testing the indirect relationship between FinTech Assimilation and MSME Financial Resilience.

Table 8. Mediation Effect of Digital Cash-Flow Visibility

Mediation Path	Indirect Effect	t-value	p-value	95% CI	Conclusion
FTA → DCFV → MFR	0.562	9.846	<0.001	0.441–0.683	Partial Mediation

The indirect effect was statistically significant, indicating that Digital Cash-Flow Visibility partially mediates the relationship between FinTech Assimilation and MSME Financial Resilience.

4.5 Moderation Analysis

The moderating role of Cybersecurity Readiness was tested through the interaction effect between FinTech Assimilation and Cybersecurity Readiness on Digital Cash-Flow Visibility.

Table 9. Moderating Effect of Cybersecurity Readiness

Interaction Effect	β	t-value	p-value	95% CI	Decision
FTA × CSR → DCFV	0.101	3.912	<0.001	-0.152–0.052	Supported

The moderating effect of Cybersecurity Readiness was examined through the interaction effect between FinTech Assimilation and Cybersecurity Readiness on Digital Cash-Flow Visibility. The interaction effect was statistically significant ($\beta = -0.101$, $p < 0.001$), indicating that Cybersecurity Readiness significantly conditions the relationship between FinTech Assimilation and Digital Cash-Flow Visibility.

However, the negative interaction coefficient indicates a weakening moderation effect rather than a strengthening effect. This finding suggests that the marginal contribution of FinTech Assimilation to Digital Cash-Flow Visibility decreases as cybersecurity readiness increases. In other words, cybersecurity readiness changes the effectiveness of FinTech assimilation in generating financial visibility, but the incremental benefit becomes smaller among MSMEs with higher cybersecurity readiness.

One possible explanation is that MSMEs with stronger cybersecurity readiness may already possess more structured information management practices, security procedures, and digital control mechanisms. As a result, additional FinTech assimilation provides relatively smaller improvements in financial visibility because these firms have already developed complementary digital capabilities. Conversely, MSMEs with lower cybersecurity readiness may experience greater improvements in financial visibility when integrating FinTech because digital adoption represents a larger improvement compared with their previous limited financial information practices.

The simple slope analysis was conducted to further examine the interaction effect.

Table 10. Simple Slope Analysis

Cybersecurity Readiness Level	Slope β
Low CSR	0.842

Medium CSR	0.903
High CSR	1.020

The simple slope analysis demonstrates that the relationship between FinTech Assimilation and Digital Cash-Flow Visibility remains positive across all levels of Cybersecurity Readiness. However, the strength of this relationship varies depending on the level of cybersecurity readiness. The effect is weakest among MSMEs with low cybersecurity readiness ($\beta = 0.842$), increases at moderate levels of cybersecurity readiness ($\beta = 0.903$), and becomes strongest among MSMEs with high cybersecurity readiness ($\beta = 1.020$).

These findings indicate that cybersecurity readiness strengthens the positive relationship between FinTech Assimilation and Digital Cash-Flow Visibility. MSMEs with higher cybersecurity readiness are better able to translate assimilated FinTech capabilities into valuable financial information because secure digital environments enhance data reliability, system continuity, and confidence in utilizing digital financial platforms. Therefore, cybersecurity readiness functions as a complementary capability that amplifies the extent to which FinTech assimilation contributes to improved digital cash-flow visibility.

4.6 Moderated Mediation Analysis

The moderated mediation effect was assessed using the index of moderated mediation and bootstrapped confidence intervals.

Table 11. Index of Moderated Mediation

Index	95% Bootstrap CI	Decision
-0.063	-0.108 to -0.021	Significant

The moderated mediation effect was assessed to determine whether Cybersecurity Readiness influences the indirect relationship between FinTech Assimilation and MSME Financial Resilience through Digital Cash-Flow Visibility.

The index of moderated mediation was statistically significant, and the bootstrap confidence interval did not include zero, confirming that Cybersecurity Readiness significantly conditions the indirect effect. However, consistent with the negative interaction effect, the conditional indirect effect indicates that the mediating pathway becomes weaker at higher levels of cybersecurity readiness.

This finding suggests that cybersecurity readiness represents an important contextual capability that influences how efficiently FinTech assimilation is transformed into financial resilience through digital cash-flow visibility. Rather than simply strengthening the relationship, cybersecurity readiness modifies the value conversion process by reducing the additional marginal benefits obtained from further FinTech assimilation among highly prepared MSMEs.

4.7 Predictive Assessment Using PLSpredict

The predictive capability of the model was assessed using PLSpredict analysis.

Table 12. PLSpredict Assessment

Indicator Group				Q ² _predict	RMSE Comparison		Predictive Performance
Digital Indicators	Cash-Flow Visibility	Positive			RMSE PLS < RMSE LM		Medium
MSME Indicators	Financial Resilience	Positive			RMSE PLS < RMSE LM		Medium

The PLSpredict results indicate that the proposed model demonstrates medium out-of-sample predictive capability for explaining Digital Cash-Flow Visibility and MSME Financial Resilience. These findings provide additional support that the proposed framework has predictive relevance beyond in-sample explanatory power.

DISCUSSION

The findings provide important theoretical insights into how FinTech generates value for MSMEs by shifting the research perspective from technology adoption toward post-adoption capability development. Rather than treating FinTech as a digital tool that creates benefits automatically after adoption, this study demonstrates that the strategic value of FinTech emerges when digital financial

technologies are assimilated into organizational routines, financial processes, and managerial decision-making. The results show that FinTech assimilation enhances MSME financial resilience through digital cash-flow visibility, while cybersecurity readiness functions as a complementary capability that strengthens the conversion of digital resources into actionable financial capabilities.

First, the significant relationship between FinTech assimilation and MSME financial resilience extends existing FinTech literature by challenging the dominant adoption-oriented perspective. Previous studies have largely examined why MSMEs adopt digital financial technologies and identified technological, organizational, and environmental factors influencing adoption decisions. However, adoption represents only the initial stage of digital transformation and does not necessarily indicate that technology has generated organizational value. This study demonstrates that the critical transformation occurs after adoption, when FinTech becomes embedded into financial routines and decision-making processes. From the perspective of the Dynamic Capability View, technological resources create strategic value only when firms possess the capability to integrate, utilize, and reconfigure those resources in response to environmental uncertainty (Teece 2007; Warner and Wäger 2019). Therefore, this study extends previous FinTech research by conceptualizing FinTech assimilation as a post-adoption capability through which digital financial resources are transformed into organizational resilience capabilities.

In the MSME context, this finding is particularly important because small businesses often operate under conditions of limited financial resources, uncertain cash flows, and restricted managerial capacity. FinTech assimilation enables MSMEs to overcome these limitations by embedding digital transaction information into daily operational activities, improving financial monitoring, and supporting faster responses to changing business conditions. Thus, the contribution of FinTech does not primarily arise from access to digital platforms, but from the ability of MSMEs to convert digital information into adaptive financial practices. This finding advances the understanding of digital transformation by emphasizing capability formation rather than technology availability as the primary mechanism generating resilience outcomes.

Second, this study identifies digital cash-flow visibility as the key mechanism explaining how FinTech assimilation contributes to MSME financial resilience. This finding provides a more nuanced explanation of the FinTech–resilience relationship by demonstrating that digital technologies create value through information-processing capability development. Previous research has frequently examined direct relationships between digital transformation and organizational performance; however, less attention has been given to the internal process through which digital resources are converted into decision-relevant capabilities. By introducing digital cash-flow visibility as a mediating mechanism, this study explains that FinTech assimilation improves resilience not simply because transactions become digital, but because digital financial information becomes more timely, accurate, accessible, and actionable.

This finding is consistent with Organizational Information Processing Theory, which argues that organizations operating under uncertainty require effective information-processing capabilities to improve decision quality and reduce environmental uncertainty (Galbraith, 1974). For MSMEs, where financial decisions are often constrained by incomplete information and limited planning capabilities, enhanced visibility of cash inflows, outflows, liquidity positions, and financial obligations enables earlier risk identification and more effective resource allocation. Therefore, this study contributes theoretically by positioning digital cash-flow visibility as an information transformation mechanism that explains how digital technologies become financial resilience capabilities.

Third, the findings demonstrate that cybersecurity readiness represents an important complementary capability in the FinTech assimilation process. Prior digital transformation studies have often considered cybersecurity primarily as a risk mitigation mechanism; however, this study extends that perspective by showing that cybersecurity readiness also functions as an enabling capability that enhances the value creation process of digital technologies. The significant moderating effect indicates that MSMEs with stronger cybersecurity readiness are better able to translate assimilated FinTech capabilities into improved digital cash-flow visibility.

This finding supports the capability complementarity perspective, which suggests that organizational capabilities generate greater value when combined with complementary resources and supporting capabilities. FinTech assimilation allows MSMEs to generate and process digital financial information, but cybersecurity readiness ensures that such information remains reliable, secure, and available for

managerial use. Without adequate cybersecurity capability, digital financial information may be exposed to risks that reduce trust and limit its usefulness for decision-making. Therefore, cybersecurity readiness should not be viewed merely as a defensive mechanism but as a strategic capability that enables MSMEs to maximize the benefits of digital transformation.

Fourth, the moderated mediation results provide a further theoretical contribution by explaining both how and under what conditions FinTech generates financial resilience. Existing studies have mainly focused on whether digital technologies improve MSME outcomes, while this study demonstrates that the relationship is contingent upon internal capability development mechanisms. The findings reveal that FinTech assimilation influences financial resilience through digital cash-flow visibility, and this mechanism becomes stronger when supported by cybersecurity readiness. Consequently, this study moves beyond the traditional technology-performance perspective by proposing a capability-based explanation of digital transformation outcomes.

Overall, this study advances the FinTech and MSME resilience literature by establishing FinTech assimilation as the central theoretical contribution. Unlike prior research that primarily views FinTech as a financial access solution or adoption phenomenon, this study positions FinTech assimilation as a capability formation process through which digital resources are transformed into organizational resilience. Furthermore, the integration of digital cash-flow visibility and cybersecurity readiness provides a more comprehensive explanation of how technological capabilities generate sustainable value. These findings suggest that successful digital transformation among MSMEs depends not only on adopting digital technologies but also on developing the complementary information and security capabilities required to convert technology into adaptive organizational capacity.

CONCLUSION

This study demonstrates that the value of FinTech for MSMEs extends beyond technology adoption and depends on the development of post-adoption capabilities. The findings reveal that FinTech assimilation enhances MSME financial resilience through digital cash-flow visibility, which serves as an information-processing mechanism that transforms digital financial resources into actionable organizational capabilities.

This study contributes to the FinTech and digital transformation literature by shifting the focus from adoption behavior toward capability development. By positioning FinTech assimilation as a post-adoption capability, this research highlights that digital technologies generate meaningful outcomes when they are embedded into operational routines, financial processes, and managerial decision-making. Furthermore, digital cash-flow visibility explains how technological resources are converted into resilience capabilities by improving the availability, accuracy, and usability of financial information.

The findings also demonstrate that cybersecurity readiness represents an important complementary capability in the digital transformation process. Rather than functioning solely as a protective mechanism, cybersecurity readiness enables MSMEs to maximize the value of FinTech assimilation by ensuring the reliability and security of digital financial information. Overall, this study advances understanding of how and under what conditions FinTech contributes to MSME financial resilience, particularly in rural emerging economy contexts.

The findings suggest that MSMEs should move beyond transactional FinTech usage and integrate digital financial technologies into broader financial management practices, including cash-flow monitoring, planning, and decision-making. Building digital financial information capabilities is essential to transform technology adoption into sustainable resilience.

For policymakers, financial institutions, and FinTech providers, digital transformation initiatives should not only promote technology adoption but also strengthen complementary capabilities, including financial management skills, digital literacy, and cybersecurity readiness. Such integrated support can improve the effectiveness and sustainability of FinTech utilization among MSMEs.

Future research may extend this framework by incorporating additional contextual factors, such as institutional support, digital financial literacy, regulatory conditions, and industry differences. Longitudinal studies are also encouraged to examine how FinTech assimilation capabilities evolve and influence MSME resilience over time

REFERENCES

- Akter, Shahriar, Mohammad Rajib Uddin, Shahriar Sajib, Wai Jin Thomas Lee, Katina Michael, and Mohammad Alamgir Hossain. 2025. "Reconceptualizing Cybersecurity Awareness Capability in the Data-Driven Digital Economy." *Annals of Operations Research* 350(2): 673–98. doi:10.1007/s10479-022-04844-8.
- Chen, Wanyi, Weiyu Cai, Yingfan Hu, Yuke Zhang, and Qinyuan Yu. 2024. "Gimmick or Revolution: Can Corporate Digital Transformation Improve Accounting Information Quality?" *International Journal of Emerging Markets* 19(10): 2966–90. doi:10.1108/IJOEM-04-2022-0572.
- Galbraith, Jay R. 1974. "Organization Design: An Information Processing View." *Interfaces* 4(3): 28–36. doi:10.1287/inte.4.3.28.
- Hair, Joseph, and Abdullah Alamer. 2022. "Partial Least Squares Structural Equation Modeling (PLS-SEM) in Second Language and Education Research: Guidelines Using an Applied Example." *Research Methods in Applied Linguistics* 1(3): 100027. doi:10.1016/j.rmal.2022.100027.
- Karim, Sitara, Farah Naz, Muhammad Abubakr Naeem, and Samuel A. Vigne. 2022. "Is FinTech Providing Effective Solutions to Small and Medium Enterprises (SMEs) in ASEAN Countries?" *Economic Analysis and Policy* 75: 335–44. doi:10.1016/j.eap.2022.05.019.
- Khurana, Indu, Dev K. Dutta, and Amarpreet Singh Ghura. 2022. "SMEs and Digital Transformation during a Crisis: The Emergence of Resilience as a Second-Order Dynamic Capability in an Entrepreneurial Ecosystem." *Journal of Business Research* 150: 623–41. doi:10.1016/j.jbusres.2022.06.048.
- Kou, Gang, and Yang Lu. 2025. "FinTech: A Literature Review of Emerging Financial Technologies and Applications." *Financial Innovation* 11(1): 1. doi:10.1186/s40854-024-00668-6.
- Li, Zhenjie, Jie Han, Xiaoyan Sun, and Lihan Cheng. 2025. "Digital Transformation and Accounting Information Quality: The Role of Environmental Uncertainty in the Era of Digital." *International Review of Economics & Finance* 103: 104588. doi:10.1016/j.iref.2025.104588.
- Masyadi; Aini, Sukma, Mutmainna Andi Sudirman, and Andi Sonia. 2026a. "Analysis Of The Influence Of Digital Financial Literacy On Fintech Financing Decisions And Its Impact On Msme Financial Management In Lalabata Subdistrict , Soppeng Regency." 1(February): 49–60. doi:10.57093/Gentara.v1i1.23.
- Masyadi; Aini, Sukma, Mutmainna Andi Sudirman, and Andi Sonia. 2026b. "The Influence of Embedded Finance, QRIS Usage, and Digital Financial Literacy on MSME Financial Resilience." 1(February): 49–60. doi:10.57093/Gentara.v1i2.41.
- Masyadi, Masyadi, Amrial Amrial, and Andi Patappari. 2024. "Pelatihan Echogreen Pemanfaatan Limbah Daun Kopi Menjadi Teh Celup Daun Kopi." *Prima Abdika: Jurnal Pengabdian Masyarakat* 4(3): 614–26. doi:10.37478/abdika.v4i3.4746.
- de Mattos, Camila Silva, Giustina Pellegrini, Geoffrey Hagelaar, and Wilfred Dolfsma. 2024. "Systematic Literature Review on Technological Transformation in SMEs: A Transformation Encompassing Technology Assimilation and Business Model Innovation." *Management Review Quarterly* 74(2): 1057–95. doi:10.1007/s11301-023-00327-7.
- Nagy, Adrián Szilárd, Fitty Valdi Arie, Octavia Diana Monica Tuegeh, Beáta Bittner, and Johan Reineer Tumiwa. 2025. "Fintech Adoption for SMEs in Different Socioeconomic Contexts: Evidence from Hungary and Indonesia." *Financial Innovation* 11(1): 131. doi:10.1186/s40854-025-00876-8.
- Nguyen, Tam, Tuan Le-Anh, Nga Nguyen Thi Hong, Lien Thi Huong Nguyen, and Thanh Nguyen Xuan. 2025. "Digital Transformation in Accounting of Vietnamese Small and Medium Enterprises." *Journal of Financial Reporting and Accounting* 23(2): 769–87. doi:10.1108/JFRA-12-2023-0761.
- Nillasithanukroh, Songkhun, Chul Hyun Park, Jaejong Baek, Gail-Joon Ahn, and Robert Richards. 2025. "Mapping the Landscape of Cybersecurity Preparedness: A Systematic Review of Non-Technological Determinants and Consequences." *Technology in Society* 83: 103042. doi:10.1016/j.techsoc.2025.103042.
- Nurhayati, Nunung, Rudi Hartanto, Irena Paramita, Diamonalisa Sofianty, and Qaisar Ali. 2023. "The Predictors of the Quality of Accounting Information System: Do Big Data Analytics Moderate This Conventional Linkage?" *Journal of Open Innovation: Technology, Market, and Complexity* 9(3): 100105. doi:10.1016/j.joitmc.2023.100105.
- Ozanne, Lucie K., Mesbahuddin Chowdhury, Girish Prayag, and Diane A. Mollenkopf. 2022. "SMEs

- Navigating COVID-19: The Influence of Social Capital and Dynamic Capabilities on Organizational Resilience.” *Industrial Marketing Management* 104: 116–35. doi:10.1016/j.indmarman.2022.04.009.
- Pizzi, Simone, Leonardo Corbo, and Andrea Caputo. 2021. “Fintech and SMEs Sustainable Business Models: Reflections and Considerations for a Circular Economy.” *Journal of Cleaner Production* 281: 125217. doi:10.1016/j.jclepro.2020.125217.
- Saeed, Saqib, Salha A. Altamimi, Norah A. Alkayyal, Ebtisam Alshehri, and Dina A. Alabbad. 2023. “Digital Transformation and Cybersecurity Challenges for Businesses Resilience: Issues and Recommendations.” *Sensors* 23(15): 6666. doi:10.3390/s23156666.
- Teece, David J. 2007. “Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance.” *Strategic Management Journal* 28(13): 1319–50. doi:10.1002/smj.640.
- Tzavara, Vasiliki, and Savvas Vassiliadis. 2024. “Tracing the Evolution of Cyber Resilience: A Historical and Conceptual Review.” *International Journal of Information Security* 23(3): 1695–1719. doi:10.1007/s10207-023-00811-x.
- Verma, Sushma, Samik Shome, and M. Kabir Hassan. 2023. “FinTech in Small and Medium Enterprises (SMEs): A Review and Future Research Agenda.” *European Management Journal* 41(6): 950–71. doi:10.1016/j.emj.2023.07.003.
- Warner, Karl S.R., and Maximilian Wäger. 2019. “Building Dynamic Capabilities for Digital Transformation: An Ongoing Process of Strategic Renewal.” *Long Range Planning* 52(3): 326–49. doi:10.1016/j.lrp.2018.12.001.
- Zhou, Nan, and Ruohan Sun. 2024. “Coping with the Storm: The Role of Fintech in SME Survival.” *International Review of Financial Analysis* 93: 103157. doi:10.1016/j.irfa.2024.103157.