

Decoding Financial Sustainability in Microfinance: The Interplay of Financial Literacy and Leadership Trust

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ABSTRACT

Purpose – This study empirically decodes the micro-level structural drivers determining the long-term financial sustainability of grassroots microfinance institutions, specifically savings and loan cooperatives in the North Sumatra region of Indonesia by uncoupling the dimensions of financial literacy.

Design/methodology/approach – Utilizing a quantitative cross-sectional survey, data was collected from 276 active cooperative members. The hypothesized causal-predictive relationships were analyzed using Variance-Based Partial Least Squares Structural Equation Modeling (PLS-SEM).

Finding/Results – Applied financial skills directly and significantly drive institutional sustainability. Financial knowledge indirectly enhances sustainability through the mediation of calculus-based institutional trust. Conversely, traditional financial culture fails to exert any significant direct or indirect effect on sustainability.

Originality/Value – This research challenges the conventional reliance on informal social capital in microfinance. By evaluating individual financial literacy (knowledge and skills) alongside the environmental context of localized financial culture. The findings suggest that technical human capital (applied skills) and cognitively validated trust—rather than communal culture alone—serve as critical foundational components for grassroots financial resilience within the tested model.

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1. Introduction

Microfinance institutions (MFIs) have emerged as pivotal instruments for fostering inclusive economic development, particularly within emerging economies. By providing essential financial services to unbanked, marginalized, and low-income populations, grassroots MFIs—such as financial cooperatives—play a transformative role in poverty alleviation and local economic empowerment. In Indonesia, a country characterized by a vast and socioeconomically diverse archipelago, cooperatives are deeply embedded in the communal fabric. They act as the primary financial lifeline for millions of micro-entrepreneurs, making their operational success critical to the nation's broader economic resilience. Despite their undeniable socioeconomic impact, the long-term viability of these grassroots institutions is frequently compromised by challenges related to financial sustainability. In the context of cooperative microfinance, financial sustainability extends beyond mere institutional profitability; it intrinsically relies on the sustainable financial behaviors, capacities, and repayment disciplines of the members themselves. When members lack the capacity to manage their finances effectively, the institution faces higher default rates, elevated operational risks, and ultimately, a severe threat to its survival.

A deeply integrated financial system serves as a critical mechanism for structural poverty alleviation. Empirical evidence suggests that nations possessing advanced financial depth consistently experience lower poverty rates compared to counterparts with similar levels of state income (Zhang & Naceur, 2019). Despite these macroeconomic benefits, academic debate persists regarding the direct efficacy of aggregate monetary growth in curbing poverty, as well as the efficiency of its indirect transmission channels through real Gross Domestic Product (Chen et al., 2021). Unchecked macroeconomic growth can sometimes create systemic barriers that paradoxically limit the capacity of impoverished populations to secure formal financing, thereby hindering their productivity, operational efficiency, and ultimate path to economic mobility (Erlando et al., 2020).

Conversely, long-term cointegration relationships established among financial depth, monetary expansion, and poverty reduction highlight how structural financial development can systematically uplift vulnerable populations (Ali & Sharif, 2020). This structural perspective aligns with contemporary literature championing Microfinance Institutions (MFIs) as vital pillars for inclusive development (Asongu et al., 2024) and targeted poverty eradication (Sulemana et al., 2023; Sultonovich, 2023). When applied to the Indonesian context, these theoretical frameworks accurately reflect the stark dualities characterizing the country's economic structure. While Indonesia boasts robust macroeconomic growth and a rapidly digitizing formal financial sector, a significant structural disconnect remains visible at the microeconomic level. This manifestation of the "missing middle" is evident in Indonesia's economy, which is overwhelmingly driven by Micro, Small, and Medium Enterprises (MSMEs) that account for over 60% of the national GDP and employ nearly 97% of the total workforce. However, as cautioned by Erlando et al. (2020), aggregate economic progress does not automatically trickle down to this segment; a vast majority of these micro-entrepreneurs operate within the informal sector, lacking the traditional collateral or formal financial track records required by deep commercial banks.

To bridge the financial exclusion gap identified by Chen et al. (2021), the Indonesian economy relies heavily on localized microfinance networks to drive grassroots inclusive growth. Grassroots institutions—such as Bank Perekonomian Rakyat (BPR), Sharia-compliant cooperatives (Baitul Maal wat Tamwil - BMT), and state-backed ultra-micro programs like PT PNM Mekar—act as the primary financial conduits for the unbanked population. In line with the findings of Asongu et al. (2024), these specialized MFIs extend beyond the mere provision of credit; they bypass the rigid, conventional barriers of the formal banking system by deploying community-based lending models, such as the joint-liability (*tanggung renteng*) mechanism, which directly enhances the productivity and financial resilience of rural women and micro-entrepreneurs.

Furthermore, reflecting the cointegration theories proposed by Ali and Sharif (2020), Indonesia's recent strategic push toward digital financial depth—characterized by the proliferation of peer-to-peer (P2P) fintech lending and the widespread integration of the Quick Response Code Indonesian Standard (QRIS) unified payment system—has drastically minimized transaction costs. This digital transformation allows rural micro-businesses to accumulate verifiable digital footprints and financial histories. Consequently, this localized digital adaptation effectively translates macroeconomic liquidity into tangible, micro-level poverty reduction, validating the crucial role of institutional governance and financial accessibility in sustainable development.

The contributions of this study are twofold. Theoretically, it enriches the microfinance and behavioral finance literature by utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) to map the complex pathways between financial literacy components, institutional trust, and sustainability. Practically, it provides actionable, evidence-based insights for MFI policymakers and cooperative leaders. By identifying which specific factors truly drive sustainability, this research offers a strategic blueprint for cooperatives in Indonesia and similar developing contexts to shift away from passive cultural socialization toward the active cultivation of targeted financial skills and core knowledge.

This study offers an original empirical investigation into the structural and behavioral micro foundations of financial sustainability within grassroots Microfinance Institutions (MFIs), specifically focusing on Savings and Loan Cooperatives (Koperasi Simpan Pinjam - KSP) within a regional context in Indonesia. While contemporary literature has exhaustively analyzed financial inclusion from macroeconomic outreach frameworks or supply-side paradigms, this research breaks new ground by uncoupling financial literacy into three distinct, competing constructs: financial knowledge (cognitive baseline), financial skills (applied operational capacity), and financial culture (socialized communal values). Furthermore, it constructs and validates a novel mediation framework driven by Trust in Institutional Leadership, capturing the critical interplay between individual human capital and organizational relational assets. Utilizing a purposive sample of 276 active cooperative members and analyzed via variance-based Structural Equation Modeling (PLS-SEM), this research provides empirical evidence indicating that practical operational capacity (skills) and cognitively validated trust are significantly associated with higher perceived grassroots financial sustainability, effectively challenging the conventional reliance on informal social capital and unguided cultural socialization. The primary purpose of this study is to empirically

decode the micro-level structural drivers that determine the long-term financial sustainability of grassroots microfinance institutions (MFIs), specifically savings and loan cooperatives (*Koperasi Simpan Pinjam*). While traditional macroeconomic policies and digital financial deepeners (such as QRIS and localized fintech) focus heavily on expanding financial *access* for underserved populations, a critical structural disconnect remains visible at the microeconomic level. In emerging economies like Indonesia, micro, small, and medium enterprises (MSMEs) drive over 60% of the national GDP and employ nearly 97% of the total workforce, yet the vast majority operate informally without traditional collateral. Grassroots cooperatives bridge this "missing middle" by deploying community-based lending models.

However, the operational survival of these vital institutions is frequently threatened because their financial sustainability intrinsically relies on the financial behavior and repayment discipline of their individual members. When members manage finances suboptimally, cooperatives face surging default rates and elevated operational risks. We are conducting this study to address a critical gap in behavioral finance and microfinance literature: conventional research frequently lumps financial literacy into a single, aggregate concept. This paper uncouples financial literacy into three distinct, competing components — financial knowledge (theoretical understanding), financial skills (practical application), and financial culture (shared social values) — and investigates how these components interact with a critical, yet understudied relational asset: Trust in Institutional Leadership.

A primary limitation of this study is the reliance on perceptual data to measure financial sustainability. Because the data was collected from regular members rather than cooperative managers or objective financial audits, the dependent variable represents *perceived* rather than *actual* institutional sustainability. While perceived stability is a crucial behavioral driver in cooperative finance, it is not a substitute for objective financial performance indicators such as Return on Assets (ROA) or Operational Self-Sufficiency (OSS). Future research should attempt to pair member perception surveys with objective financial panel data to examine the direct correlation between member confidence and institutional financial health."

2. Literature Review & Hypothesis Development

Financial Literacy
This study integrates Human Capital Theory, Social Capital Theory, and Agency Theory to construct a cohesive micro-level framework for financial sustainability in grassroots microfinance. Traditional microfinance literature often aggregates financial literacy into a singular construct. In contrast, this study uncouples it into internal cognitive and operational capabilities (Financial Knowledge and Skills), rooted in Human Capital Theory (Becker, 1962), and external environmental norms (Financial Culture), grounded in Social Capital Theory (Putnam, 2000). To bridge the gap between individual capabilities and organizational outcomes, Agency Theory (Jensen & Meckling, 1976) is employed to position Trust in Institutional Leadership as the critical mediating mechanism that mitigates information asymmetry and aligns member behaviors with institutional sustainability.

Within the framework of Human Capital Theory, financial knowledge and applied financial skills represent specialized, intangible assets that individuals accumulate to optimize resource allocation and smooth consumption. Financial knowledge functions as the cognitive baseline, reflecting an individual's theoretical understanding of concepts like compound interest,

inflation, and risk diversification. Financial skills, conversely, represent the applied operational capacity to execute personal budgets, manage debt, and navigate financial distress. By empowering individuals to independently manage personal financial shocks, this internal human capital directly lowers the institution's default risks and operational vulnerabilities, thereby serving as the primary structural driver of the cooperative's long-term financial sustainability. To contrast the internal cognitive traits of human capital, this study evaluates Financial Culture through the lens of Social Capital Theory. Financial culture represents the external, environmental norms and the localized density of communal networks. It encompasses the shared values and socialized behaviors within a community. While social capital is highly effective at enforcing community-based solidarity and informal compliance, dense intra-community networks often lack the capacity to generate the specialized, technical operational skills required for formal financial resilience. Therefore, this framework positions culture as a contextual socializing agent rather than a direct substitute for technical human capital.

The mediating role of institutional trust is derived directly from Agency Theory. In the unique structure of cooperative microfinance, members (the principals) delegate the management of their pooled resources to institutional leaders (the agents). Because continuous monitoring of grassroots leaders is constrained by limited resources and information asymmetry, institutional trust serves as the critical mechanism to mitigate agency costs. When members utilize their financial knowledge to cognitively verify the competence and integrity of leadership, it bridges the principal-agent gap. This cognitively validated trust drastically diminishes the perceived risk of moral hazard, thereby incentivizing members to maintain disciplined repayment behaviors and sustainable financial participation.

Financial skills

The theoretical foundation linking individual financial competencies to institutional sustainability is grounded in Human Capital Theory (Becker, 1962). Within this primary framework, financial knowledge and applied financial skills represent specialized, intangible assets. Members accumulate this human capital to optimize resource allocation, manage debt, and smooth consumption over their life cycle. By empowering individuals to navigate personal financial shocks, this internal human capital directly lowers the institution's default risks and operational vulnerabilities, thereby serving as the primary structural driver of the cooperative's long-term financial sustainability. Financial skills relate to the individual's ability, when making financial decisions, to minimize the possibility of getting caught up in financial distress (Priyadharsini, 2017). Personal financial problems are frequently caused by the lack of basic financial skills in preparing budgets, and the inability to understand credit and investment instruments or other financial products. The lack of financial skills among individuals was identified as one of the contributing causes of historical financial crises (Lusardi & Mitchell, 2011). These practical skills can be improved by various approaches, including targeted education, training, and consultation (Elbogen et al., 2011).

Financial culture

To contrast the internal cognitive traits of human capital, this study evaluates Financial Culture through the lens of Social Capital Theory (Putnam, 2000; Portes, 1998). Financial culture represents the external, environmental norms and the localized density of communal networks. While social capital is highly effective at enforcing community-based solidarity and informal compliance, dense intra-community networks often lack the capacity to generate the specialized, technical operational skills required for formal financial resilience. Therefore, this framework positions culture as a contextual socializing agent rather than a direct substitute for technical human capital. Unlike financial knowledge and skills, which are internal cognitive and operational traits belonging to the individual, financial culture serves as the external, environmental context in which economic decisions are made. Financial culture represents the conceptual paradigm wherein a community's prevailing cultural values and social norms are fundamentally embedded into an individual's financial consciousness. Financial culture represents the conceptual paradigm wherein a community's prevailing cultural values are fundamentally embedded into an individual's financial consciousness, ultimately shaping their long-term financial behaviors and habits. This structural linkage is evidenced by the deep interdependence between an individual's personal financial choices and the collective financial decision-making quality of their residing community (Csiszárík-Kocsir et al., 2016). Furthermore, a person's foundational financial beliefs and values are systematically constructed through continuous socialization—a mechanism that bridges the individual, the socializing agents, and specific learning contexts (Mohamed, 2017). Such developmental interactions typically manifest through collaborative group discussions, formal financial education, or targeted guidance counseling (Whitebread & Bingham, 2013).

Financial Knowledge

From a broader theoretical perspective, financial knowledge can be situated within the framework of Human Capital Theory (Becker, 1962). Within this paradigm, financial knowledge functions as a specialized, intangible asset—a form of human capital—that individuals accumulate to optimize resource allocation, smooth consumption, and maximize utility over their life cycle. In the specific context of microfinance and cooperatives, this theoretical knowledge serves a dual purpose. Relying on Agency Theory and the concept of Information Asymmetry (Stiglitz & Weiss, 1981), equipping cooperative members with strong financial knowledge reduces the informational gap between the institution and the borrower. This cognitive empowerment minimizes the risks of adverse selection and moral hazard, as informed members are more capable of evaluating risk, understanding contractual obligations, and avoiding over-indebtedness. Consequently, financial knowledge is not merely a passive absorption of economic concepts, but an essential cognitive resource that drives sustainable financial decision-making and institutional stability.

Financial knowledge reflects the individual's theoretical understanding of financial issues. It is measured by assessing various aspects of basic financial knowledge, including compound interest, inflation, deposits, the time value of money, diversification, interest rates, debt, and assets. Financial knowledge forms the cognitive basis of financial literacy, which aids individuals in establishing sound financial behavior. This theoretical foundation plays a crucial role at a time when the choice of financial products is increasingly complex and easily accessible (Lusardi & Mitchell, 2014; van Rooij et al., 2011).

Trust in Institutional Leadership

"The mediating role of institutional trust is strictly derived from Agency Theory (Jensen & Meckling, 1976). In the unique structure of cooperative microfinance, members (the principals) delegate the management of their pooled resources to institutional leaders (the agents). Because continuous monitoring of grassroots leaders is constrained by limited resources and information asymmetry, institutional trust serves as the critical mechanism to mitigate agency costs. When members utilize their financial knowledge to cognitively verify the competence and integrity of leadership, it bridges the principal-agent gap. This cognitively validated trust drastically diminishes the perceived risk of moral hazard, thereby incentivizing members to maintain disciplined repayment behaviors and sustainable financial participation

In institutional literature, trust is operationalized as a strategic asset. When stakeholders trust institutional leadership, it significantly reduces transaction costs, lowers perceived risk, and enhances institutional stability. According to the foundational organizational trust framework by Mayer, Davis, and Schoorman (1995), trust in leadership is built on three core dimensions: Ability (Competence), Benevolence (Care), and Integrity (Fairness). For MSMEs and grassroots cooperatives, leaders play a vital role in making strategic decisions concerning business development (Kariuki, 2021), and institutional trust ensures members remain engaged with the cooperative's financial mechanisms.

Furthermore, trust functions as an indispensable mechanism within the framework of Agency Theory (Jensen & Meckling, 1976). In the unique structure of cooperative microfinance, members (the principals) delegate the management of their pooled financial resources to the institutional leaders (the agents). Because direct, continuous monitoring by grassroots members is often constrained by limited resources, time, or technical expertise, high institutional trust serves to effectively mitigate "agency costs." When members possess a strong belief in the leadership's competence and integrity to act in the collective's best interest, the perceived risk of moral hazard, elite capture, or fund mismanagement drastically diminishes.

Financial sustainability

Sustainable MFIs are those that successfully innovate their operational architectures to minimize these frictions. Grassroots financial institutions frequently encounter structural challenges, including segmented markets, highly dispersed populations, and underdeveloped physical infrastructure, all of which culminate in elevated operational costs (Non, 2023). Amidst rapid sector scaling, the primary strategic imperatives remain the expansion of institutional outreach, optimization of localized management, and the long-term preservation of institutional financial sustainability (Dessalegn, 2018). Institutionalists argue that creating a sustainable financial services sector for the poor should be a primary objective of microfinance, ensuring that organizations can maintain operations without continuous external subsidization (Deb, 2018). Identifying the operational variables driving this sustainability is critical for enabling community-based financiers to maintain consistent asset growth and promote inclusive economic development. The following matrix details how this study bridges the identified theoretical and empirical gaps left unresolved by preceding literature:

Tabel 1 Identified theoretical and empirical

Research Stream & Citations	Traditional Academic Consensus	The Novel Shift Offered By This Study
Macroeconomic Cointegration & Inclusion (Ali & Sharif, 2020; Chen et al., 2021)	Assumes aggregate monetary expansion, digitization (QRIS), and baseline financial access automatically trickle down to reduce microeconomic poverty.	Identifies the structural breakdown at the microeconomic level ("missing middle") and models the exact micro-foundations needed to convert macroeconomic liquidity into institutional resilience.
Rural MFI Sustainability (Atahau et al., 2023)	Demonstrates that generalized financial literacy impacts sustainability through the broad channel of institutional governance.	Disentangles literacy into three competing sub-constructs, proving that practical skill is the most powerful direct driver, outperforming mere theoretical knowledge and culture.
Social Capital & Cultural Economics (Portes, 1998; Csiszárík-Kocsir et al., 2016)	Posits that communal cultural networks and socialized group socialization inherently dictate sustainable local resource allocation.	Exposes the insularity of dense networks, empirically demonstrating that informal financial culture lacks the capacity to generate technical sustainability without formal human capital.
Organizational Trust & Microfinance (Mayer et al., 1995; Zarifis, 2024)	Views trust primarily as an affective emotional bond that fosters cooperative retention and generalized compliance.	Operationalizes trust as a calculus-based asset built on cognitive evaluation, serving as the essential mediation pathway that transforms raw knowledge into verifiable financial discipline.

Hypothesis development and research framework

According to a study conducted by Atahau et al. (2023), financial literacy plays a vital role in the transformation and long-term sustainability of rural Microfinance Institutions (MFIs). The researchers—Apriani Dorkas Rambu Atahau, Imanuel Madea Sakti, Alliny Namilana Rambu Hutar, Andrian Dolfriandra Huruta, and Min-Sun Kim—demonstrated that financial literacy exerts a positive effect on MFI sustainability, operating both directly and indirectly through the mediating channel of governance. Atahau et al. (2023). The highlight that when both MFI managers and their customers possess adequate financial literacy, it fosters significantly better institutional management. In their framework, a well-governed MFI is characterized by well-organized administration and professional financial management, which ultimately yields critical institutional benefits such as heightened financial stability and enduring sustainability. Interestingly, the demographic description of the respondents in Atahau et al. (2023) revealed that while the majority possessed high financial literacy, they simultaneously faced systemic limitations regarding job availability, education levels, and prior work experience. Ultimately, the findings from this 2023 study offer valuable insights for rural MFIs and policymakers alike, underscoring the urgent need to improve the financial literacy of MFI managers to effectively support the broader transformation of the rural microfinance sector.

The following figure illustrates the conceptual framework designed for the hypothesis development of this research. The proposed model delineates the structural relationships among three primary exogenous variables: financial skills, financial culture, and financial knowledge. Furthermore, it maps how these foundational determinants are hypothesized to interact with and influence the ultimate endogenous outcome, financial sustainability, both directly and indirectly through the central mediating mechanism of trust in institutional leadership.

of one year. The recruitment process was facilitated through cooperative branch managers, who distributed the surveys to eligible members during standard operational hours and weekly meetings. Out of 362 questionnaires distributed, 276 valid and fully completed responses were returned, yielding an effective response rate of 73,5%. Methodologically, this final sample size ($N=276$) comfortably satisfies the minimum statistical power requirements for PLS-SEM. While the sample is clustered within specific regional institutions, the demographic profile exhibits robust diversity. This study adopts a quantitative, explanatory research design utilizing a cross-sectional survey approach to evaluate the structural relationships and causal pathways between financial literacy configurations, institutional trust, and financial sustainability. The empirical context of this research is centered on the grassroots microfinance sector in Indonesia, specifically focusing on Savings and Loan Cooperatives (Koperasi Simpan Pinjam - KSP) within a regional context in Indonesia. These member-owned institutions represent a critical socioeconomic lifeline for the country's extensive micro-entrepreneurial ecosystem, which operates outside the traditional commercial banking sector.

Sampling Architecture and Respondent Profile

The target population comprises active members of registered financial cooperatives in Indonesia. To ensure data validity and rigorous representation, a non-probability purposive sampling technique was deployed based on two strict inclusion criteria:

1. The participant must hold an active registration status as a member of an Indonesian financial cooperative.
2. The participant must have actively utilized the cooperative's core financial services (e.g., credit facilities, savings products, or capital funds) for a minimum threshold of one year.

To rigorously justify the sample adequacy, an a priori statistical power analysis was conducted using G*Power software. Based on the structural model, the maximum number of predictors directed at a single endogenous construct (Financial Sustainability) is 4 (Financial Skills, Financial Culture, Financial Knowledge, and Trust in Institutional Leadership). To achieve a conventional statistical power ($1-\beta$) of 0.80 and a significance level (α) of 0.05 to detect a medium minimum effect size ($f^2 = 0.15$), the minimum required sample size generated by the software is 85 respondents. The achieved sample size of $N = 276$ comfortably exceeds this rigorous threshold, thereby guaranteeing highly robust statistical power for the PLS-SEM path estimations and firmly resolving the limitations of the traditional ten-times rule.

Measures and Operationalization of Variables

All latent constructs were operationalized using multi-item scales adapted from validated psychometric and econometric literature, modified slightly to fit the cooperative microfinance context. Responses were captured using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

- a) Financial Skills (X1): Measured through 4 indicators assessing members' self-reported tactical operational capacities, including budgeting execution, systematic saving behaviors, financial product evaluation, and debt management.
- b) Financial Culture (X2): Measured via 3 indicators capturing the members' exposure to and participation in localized financial discourse, mentoring access, and structural financial socialization within their community.

- c) Financial Knowledge (X3): Evaluated through 5 indicators testing respondents' cognitive comprehension of baseline financial principles, including compound interest, inflation dynamics, the time value of money, risk diversification, and asset management.
- d) Trust in Institutional Leadership (Z1): Operationalized through 4 strategic dimensions adapted from foundational organizational trust frameworks. These indicators measure members' perceptions of the leadership's managerial competence, strategic decision-making, crisis resilience, and operational transparency.
- e) Perceived Institutional Financial Sustainability (Y1): Measured via 5 indicators assessing members' confidence in the cooperative's institutional performance and long-term viability. To align with the member-level unit of analysis, these indicators capture the respondents' subjective assessments and trust regarding the cooperative's profitability, operational efficiency, self-sufficiency, and capital adequacy, rather than relying on objective accounting ratios.

To align with the level of analysis provided by the respondent sample (regular cooperative members), the dependent variable (Y) in this study is defined as Perceived Institutional Financial Sustainability. Because ordinary members do not typically possess access to internal financial metrics—such as capital adequacy, portfolio at risk (PAR), or operational self-sufficiency (OSS)—they cannot objectively assess the institution's actual financial health. Instead, this study measures the members' subjective *confidence* in the cooperative's long-term viability. Capturing this perception is critical in cooperative microfinance literature; member trust and perceived stability are primary drivers of deposit mobilization, continued patronage, and disciplined loan repayment. When members perceive an institution as unsustainable, it can trigger capital flight and elevated default rates. Therefore, perceived sustainability serves as a vital leading indicator of cooperative survival. The construct was operationalized by asking respondents to evaluate their confidence in the cooperative's ability to protect their savings, maintain future operations, and withstand economic shocks.

Rather than asking members to estimate objective profit margins or efficiency ratios, the survey items were designed to capture their *assessment of stability*. Respondents indicated their level of agreement on a 5-point Likert scale with statements such as, 'I am confident in the cooperative's ability to survive financial difficulties,' and 'I trust the cooperative has sufficient resources to protect member savings.'

State-of-the-Art Data Analysis Method

To test the hypothesized causal-predictive relationships, this study applies Variance-Based Partial Least Squares Structural Equation Modeling (PLS-SEM) operationalized through SmartPLS software. PLS-SEM is selected as the state-of-the-art methodology over Covariance-Based SEM (CB-SEM) due to its superior statistical power in analyzing highly complex models incorporating multi-indicator constructs, structural mediation, and exploratory behavioral frameworks without requiring strict multivariate normality assumptions. The evaluation follows a rigorous two-step econometric process: Measurement Model Assessment: Evaluates the internal consistency reliability, convergent validity via Average Variance Extracted (AVE), and discriminant validity utilizing the Fornell-Larcker criterion. Structural Model Assessment: Determines the predictive power and significance of paths by calculating the Coefficient of Determination (R^2), and deploying a non-parametric bootstrapping routine

with 5,000 resamples to evaluate the standardized path coefficients (β), t-statistics, and exact p-values. The fundamental structural equation governing the mediation model is formalised as follows:

$$Z_1 = \gamma_1 X_1 + \gamma_2 X_2 + \gamma_3 X_3 + \zeta_1 \dots\dots\dots(1)$$

$$Y_1 = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 Z_1 + \zeta_2 \dots\dots\dots(2)$$

Where:

Y1 is the ultimate endogenous outcome (Financial Sustainability).

Z1 represents the structural mediator (Trust in Institutional Leadership).

X1,X2,X3 are the exogenous constructs representing Financial Skills, Culture, and Knowledge respectively.

γ and β represent the standardized regression path coefficients.

ζ_1 and ζ_2 indicate the stochastic error terms representing unexplained variance.

4. Result and Discussion

In Indonesia, cooperatives (*koperasi*) serve as a foundational pillar of the national economy, deeply rooted in the constitutional mandate (Article 33 of the 1945 Constitution) that emphasizes the economy should be structured as a common endeavor based on the principle of mutual assistance and kinship (*asas kekeluargaan*). Unlike conventional commercial banks that prioritize shareholder profit, Indonesian cooperatives operate as member-owned microfinance institutions (MFIs) designed to maximize collective welfare.

The cooperative sector, particularly Savings and Loan Cooperatives (*Koperasi Simpan Pinjam* or KSP), plays a pivotal role in driving financial inclusion. These grassroots institutions effectively bridge the financial gap for the "missing middle" —comprising micro, small, and medium enterprises (MSMEs), agricultural workers, and rural communities—who frequently lack the collateral and formal credit histories required by mainstream commercial banking. By leveraging localized social capital, geographic proximity, and flexible community-based lending mechanisms, cooperatives in Indonesia effectively lower transaction costs and mitigate information asymmetry, making them an indispensable engine for local economic empowerment, poverty reduction, and inclusive growth.

To understand the socio-economic dynamics of the cooperative members participating in this study, a detailed demographic profiling was conducted. Table 2 presents the descriptive statistics of the respondents across several key categories, including gender, age, education level, occupation, and duration of cooperative membership.

Table 2. Respondents' characteristics

Variables	Category	Count	Percentage
Gender	Male	108	39%
	Female	168	61%
Age (years)	20-30	56	20%
	30-40	68	25%
	40-50	88	32%
	51-60	53	19%
	>60	11	4%
Education Level	Primary School (SD)	4	1%
	Junior High School (SMP)	20	7%

Occupation	Senior High School (SMA)	97	35%
	Associate Degree (D2)	2	1%
	Associate Degree (D3)	44	16%
	Bachelor's Degree (S1)	93	34%
	Master's Degree (S2)	16	6%
	Farmer	133	48%
	Entrepreneur / Self-employed	66	24%
	Civil Servant (PNS)	40	14%
	Private Sector Employee	37	13%
Membership			
Duration (years)	1-2	29	11%
	3-4	45	16%
	5-7	76	28%
	8-10	82	30%
	>10	44	16%

Source: Data analyzed by the researcher, 2026

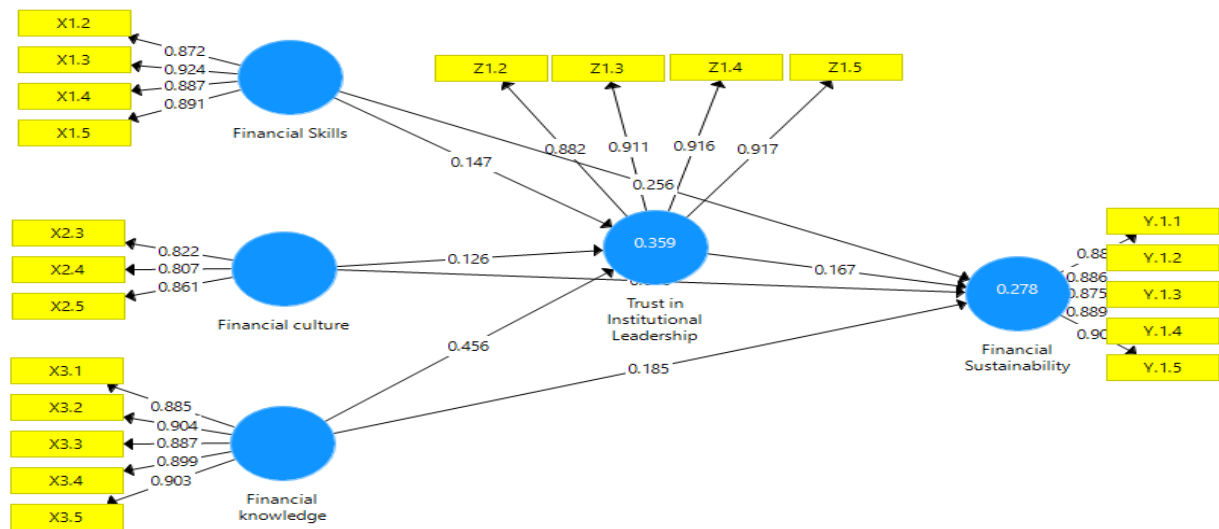
Based on the provided data, the demographic profile of the 276 respondents can be described as follows:

1. The sample is predominantly female, accounting for 61% (168 individuals) of the respondents, compared to the male representation of 39% (108 individuals).
2. The majority of the respondents fall into the middle-aged demographic. The largest age group is between 40-50 years old at 32%, followed closely by the 30-40 years age bracket at 25%. Younger members (20-30 years) make up 20% of the sample, while senior members over 60 years old constitute the smallest group at 4%.
3. The educational background of the respondents is generally high, with the two largest groups holding a Senior High School (SMA) diploma (35%) and a Bachelor's Degree (S1) (34%). A significant portion also holds an Associate Degree (D3) at 16%. Only a small minority have an education level of Junior High School (7%) or lower.
4. Farming is the dominant livelihood among the respondents, making up nearly half of the sample at 48% (133 individuals). Entrepreneurs or self-employed individuals make up the second-largest group at 24%, while Civil Servants and Private Sector Employees are fairly evenly distributed at 14% and 13%, respectively.
5. The data indicates a loyal and established membership base. The majority of respondents have been members for 5 to 10 years, specifically 28% for 5-7 years and 30% for 8-10 years. Furthermore, 16% of the respondents have been members for over a decade, indicating strong long-term retention.

Structural model

The following structural model analysis outlines the relationships between key determinants and their impact on Financial Sustainability, replacing the original "Financial Sustainability" outcome variable. The model utilizes Structural Equation Modeling (SEM) to examine how independent variables influence both the mediating variable (Trust in Institutional Leadership) and the ultimate outcome variable, Financial Sustainability.

Figure 2. The structural model



Source: Data analyzed by the researcher, 2026

The analysis of the structural model was to ensure that the structure sense of the models proposed was sound, based on the factors of accuracy and trustworthiness. As such, the importance of tests like the Coefficient of Determination, Predictive Relevance, and the Goodness of Fit Index (GoF) should not be overlooked. These tests were used as a means to determine if the research model was better at exploring the variables, based on the coefficient of determination's index being high, so it matched as well (Sarstedt et al., 2021).

The measurement model assessment evaluates internal consistency reliability using Cronbach's Alpha, rho_A, and Composite Reliability (CR). Convergent validity is established via the Average Variance Extracted (AVE). To address potential collinearity among indicators, Variance Inflation Factors (VIF) are examined, ensuring all values fall below the recommended threshold of 3.0. Finally, discriminant validity is rigorously assessed using both the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio of correlations, including HTMT confidence intervals to ensure the upper bounds do not exceed 0.90 (Hair et al., 2021).

Table 3. Construct Reliability, Convergent Validity, and Indicator Collinearity

Construct & Indicators	Factor Loading	VIF	Cronbach's Alpha	rho_A	Composite Reliability (CR)	AVE
Financial Skills			0,916	0,924	0.941	0.799
X1.2	0.872	2,726				
X1.3	0.924	3,654				
X1.4	0.887	2,777				
X1.5	0.891	3,013				
Financial Culture			0,778	0,792	0.869	0.689
X2.3	0.822	1,378				
X2.4	0.807	1,873				
X2.5	0.861	2,058				
Financial Knowledge			0,938	0,940	0.953	0.802
X3.1	0.885	3,153				
X3.2	0.904	3,678				
X3.3	0.887	3,089				
X3.4	0.899	3,265				
X3.5	0.903	3,831				
Financial Sustainability			0,933	0,936	0.949	0,788

Y.1.1	0.887	3,442				
Y.1.2	0.886	3,163				
Y.1.3	0.875	2,818				
Y.1.4	0.889	3,583				
Y.1.5	0.903	3,483				
Institutional Trust			0,928	0,929	0,949	0,822
Z1.2	0.882	2,744				
Z1.3	0.911	3,347				
Z1.4	0.916	3,528				
Z1.5	0.917	3,603				

Source: Data analyzed by the researcher, 2026

Once the measurement model had been evaluated and had presented satisfactory results, an evaluation of the structural model was carried out. This evaluation made use of the R-squared results, referring to the goodness-of-fit model to identify the magnitude and the effect of the external variables (Financial Skills, Financial Culture, and Financial Knowledge), as well as explaining the internal variables at play in this research. The mediating variable, Trust in Institutional Leadership, had an R-squared value of 0.619, meaning that this variable could be explained by the independent variables to a significant extent. The same could be said for Financial sustainability as the dependent variable. The structural model could explain the results of Financial sustainability by up to 61.9 percent of the entire picture.

Table 4. Discriminant validity: Fornell- Larcker criterion

	Financial Skills	Financial culture	Financial knowledge	Financial sustainability	Trust in Institutional Leadership
Financial Skills	0,894				
Financial culture	0,315	0,830			
Financial knowledge	0,464	0,349	0,896		
Financial sustainability	0,433	0,277	0,426	0,888	
Trust in Institutional Leadership	0,398	0,331	0,568	0,400	0,907

Source: Data analyzed by the researcher, 2026

According to the Fornell-Larcker criterion, discriminant validity is established if the square root of the Average Variance Extracted (AVE) of each construct is greater than its highest correlation with any other construct in the model. The Diagonal Values: The values located on the main diagonal (0.894, 0.830, 0.896, 0.888, and 0.907) represent the square roots of the AVE for each respective variable. The Off-Diagonal Values: The numbers positioned below the diagonal represent the correlation coefficients between the constructs. For example, the correlation between Financial Skills and Financial culture is 0.315. Because every single value on the main diagonal is strictly greater than all the corresponding off-diagonal correlation values in its row and column, the discriminant validity for all constructs is successfully established. This means that Financial Skills, Financial culture, Financial knowledge, Financial sustainability, and Trust in Institutional Leadership are all empirically distinct and valid variables for the research model.

Table 5 presents the Heterotrait-Monotrait (HTMT) ratio of correlations, which is the contemporary standard for evaluating discriminant validity in Variance-Based Structural

Equation Modeling (PLS-SEM). Discriminant validity assessments ensure that each latent Construct in the conceptual model is empirically distinct and accurately measures phenomena not captured by other variables.

Table 5 Heterotrait-Monotrait Ratio (HTMT)

	Financial Skills	Financial culture	Financial knowledge	Financial sustainability
Financial Skills				
Financial culture	0,359			
Financial knowledge	0,497	0,403		
Financial sustainability	0,463	0,310	0,449	
Trust in Institutional Leadership	0,430	0,386	0,606	0,426

Source: Data analyzed by the researcher, 2026

According to methodological guidelines (Henseler et al., 2015; Hair et al., 2021), discriminant validity is achieved when the HTMT values fall below the conservative threshold of 0.85 (or the more liberal threshold of 0.90). Values exceeding 0.90 suggest a lack of discriminant validity, indicating that two or more variables are conceptually overlapping. As illustrated in Table 5, the highest recorded HTMT value in the model is 0.606 (between *Trust in Institutional Leadership* and *Financial Knowledge*). Because all reported HTMT values—which range from a low of 0.310 to a maximum of 0.606—are strictly below the stringent 0.85 threshold, robust discriminant validity is fully established. This confirms that all constructs within the model (Financial Skills, Financial Culture, Financial Knowledge, Financial sustainability, and Trust in Institutional Leadership) are theoretically and empirically distinct entities.

This table evaluates the structural model's explanatory power and the specific impact of each independent variable on the dependent variables. The evaluation is divided into two metrics: the Coefficient of Determination (R^2) and the Effect Size (f^2).

Table 6. Coefficient of Determination (R^2) and Effect Size (f^2)

Endogenous (Target) Variable	R^2	Predictor (Exogenous) Variable	f^2
Trust in Institutional Leadership	0.359	Financial Skills	0.026
		Financial Culture	0.021
		Financial Knowledge	0.240
Financial sustainability	0.278	Financial Skills	0.067
		Financial Culture	0.007
		Financial Knowledge	0.028
		Trust in Institutional Leadership	0.025

Source: Data analyzed by the researcher, 2026

The model explains 35.9% of the variance in Institutional Trust ($R^2 = 0.359$) and 27.8% in Financial Sustainability ($R^2 = 0.278$), both of which are considered moderate and acceptable in the behavioral sciences. Regarding effect sizes (f^2), Financial Knowledge is the primary catalyst for Institutional Trust, demonstrating a medium effect ($f^2 = 0.240$). In contrast, Financial Skills and Financial Culture have only small effects on Trust ($f^2 = 0.026$ and 0.021 , respectively). For Financial Sustainability, Financial Skills ($f^2 = 0.067$), Financial Knowledge ($f^2 = 0.028$), and Institutional Trust ($f^2 = 0.025$) all exert small effects. Notably, Financial Culture has a negligible impact on Financial Sustainability ($f^2 = 0.007$), falling below the 0.02 minimum threshold and confirming that cultural norms alone do not practically drive outcomes.

The empirical results reveal the varying direct impacts of the exogenous constructs and the mediating variable on the ultimate endogenous outcome, financial sustainability.

Table 7. Path Coefficients

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Decision
H1: Financial Skills -> Financial sustainability	0,256	0,262	0,069	3,704	0,000	Accepted
H2: Financial Skills -> Trust in Institutional Leadership	0,147	0,149	0,064	2,284	0,023	Accepted
H3: Financial culture -> Financial sustainability	0,076	0,078	0,057	1,329	0,185	Not Accepted
H4: Financial culture -> Trust in Institutional Leadership	0,126	0,129	0,057	2,208	0,028	Accepted
H5: Financial knowledge -> Financial sustainability	0,185	0,185	0,094	1,967	0,050	Accepted
H6: Financial knowledge -> Trust in Institutional Leadership	0,456	0,454	0,061	7,416	0,000	Accepted
H7: Trust in Institutional Leadership -> Financial sustainability	0,167	0,163	0,081	2,079	0,038	Accepted

Source: Data analyzed by the researcher, 2026

Based on the structural model results presented in Table 7, the direct effects of the independent variables on the dependent variables were evaluated. The analysis reveals the following outcomes for the proposed hypotheses:

1. The analysis demonstrates a highly significant, positive relationship between financial skills and financial sustainability (beta = 0.256, T = 3.704, p < 0.001). Consequently, H1 is empirically supported and accepted, indicating that greater practical financial proficiency directly enhances sustainable financial outcomes.
2. Financial skills also positively and significantly influence trust in institutional leadership (beta = 0.147, T = 2.284, p = 0.023), providing robust support for the acceptance of H2. In contrast, the direct impact of financial culture on financial sustainability is found to be statistically insignificant (beta = 0.076, T = 1.329, p = 0.185).
3. Therefore, H3 is not accepted, demonstrating that ingrained financial culture alone is insufficient to directly drive financial sustainability. However, the empirical data confirms that financial culture maintains a significant positive association with institutional trust (beta = 0.126, T = 2.208, p = 0.028), leading to the acceptance of H4.
4. Financial knowledge exerts a statistically significant positive direct effect on financial sustainability (beta = 0.185, T = 1.967, p = 0.050), supporting the acceptance of H5.
5. Financial knowledge exhibits the most robust positive effect on trust in institutional leadership (beta = 0.456, T = 7.416, p < 0.001). This represents the strongest structural path within the entire model, resulting in the unequivocal acceptance of H6.
6. Finally, trust in institutional leadership is proven to be a significant, positive antecedent to financial sustainability (beta = 0.167, T = 2.079, p = 0.038), leading to the acceptance of H7.

This section elaborates on the mediation analysis conducted to evaluate the indirect pathways within the structural model. Specifically, Table 6 presents the assessment of how trust in institutional leadership mediates the relationships between the three exogenous determinants—financial skills, financial culture, and financial knowledge—and the ultimate endogenous outcome, financial sustainability. Analyzing these indirect effects is critical for

understanding whether the foundational competencies and cultural norms rely on institutional trust as a bridging mechanism to achieve sustainable outcomes.

Table 8. Indirect effects

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Decision
H8: Financial Skills -> Trust in Institutional Leadership -> Financial sustainability	0,025	0,024	0,016	1,545	0,123	Not Accepted
H9: Financial culture -> Trust in Institutional Leadership -> Financial sustainability	0,021	0,022	0,015	1,363	0,174	Not Accepted
H10: Financial knowledge -> Trust in Institutional Leadership -> Financial sustainability	0,076	0,074	0,038	2,008	0,045	Accepted

Source: Data analyzed by the researcher, 2026

Based on the results presented in Table 8, a mediation analysis was conducted to evaluate the indirect effects of the independent variables on Financial sustainability, with Trust in Institutional Leadership serving as the mediating variable. The findings for the three hypotheses are as follows:

1. Financial Skills (H8): The indirect effect of Financial Skills on Financial sustainability through Trust in Institutional Leadership is not statistically significant. This is indicated by a t-statistic of 1.545, which falls below the standard 1.96 threshold, and a p-value of 0.123, which exceeds the 0.05 significance level. Therefore, H8 is not accepted.
2. Financial Culture (H9): Similarly, Trust in Institutional Leadership does not significantly mediate the relationship between Financial Culture and Financial sustainability. The analysis yields a t-statistic of 1.363 and a p-value of 0.174. Since the p-value is greater than 0.05, H9 is not accepted.
3. Financial Knowledge (H10): In contrast, the indirect effect of Financial Knowledge on Financial sustainability through Trust in Institutional Leadership is statistically significant. The results demonstrate a t-statistic of 2.008 (exceeding the 1.96 benchmark) and a p-value of 0.045 (below the 0.05 benchmark). Consequently, H10 is accepted, indicating that Trust in Institutional Leadership successfully mediates the impact of Financial Knowledge on Financial sustainability.

Discussion

The analysis confirms that applied financial skills exert a highly significant direct impact on financial sustainability ($\beta = 0.256, p < 0.001$), leading to the acceptance of H1. Viewed strictly through the lens of Human Capital Theory, this indicates that cooperative members who possess tangible, actionable skills—such as cash flow management and budget execution—are better equipped to navigate personal financial shocks without defaulting on their obligations. Conversely, H3 was rejected, demonstrating that financial culture fails to directly drive sustainability ($\beta = 0.076, p = 0.185$). This finding exposes a critical boundary condition of Social Capital Theory within microfinance: while environmental norms and community values may foster general solidarity, they cannot substitute for the individual-level cognitive

traits and operational capabilities required to navigate complex financial obligations. A culture that encourages saving is ineffective if members lack the actual technical skills to create a budget surplus. This requires a paradigm shift for grassroots cooperatives: institutional survival cannot rely solely on communal affinity; it requires the deliberate, structural upgrading of members' hard financial competencies.

While theoretical knowledge (H5) provides the necessary cognitive foundation, its most profound impact lies in its ability to foster institutional trust (H6: $\beta = 0.456$, $p < 0.001$). The mediation analysis (H10) confirms that trust in institutional leadership successfully translates this financial knowledge into enhanced sustainability outcomes. This pathway is robustly explained by Agency Theory. In the decentralized environment of grassroots microfinance, continuous monitoring of cooperative leadership (the agents) by the members (the principals) is severely constrained by information asymmetry. Financial knowledge acts as an informational equalizer. Members with higher financial knowledge are better equipped to objectively comprehend and evaluate the strategic decisions made by cooperative leadership. Because they understand the institutional mechanics, they do not rely on blind faith; instead, they develop calculus-based, cognitively verified trust. Once this trust is established, it significantly reduces agency costs and the perceived risk of moral hazard (H7), encouraging members to engage in the sustainable financial behaviors (e.g., disciplined loan repayment and continued patronage) that ultimately secure the institution's operational survival.

Interestingly, institutional trust does not mediate the relationship between practical financial skills and sustainability (H8 rejected). A member's practical ability to execute a personal budget operates as an internal capability that directly lowers their default risk, bypassing the principal-agent relational dynamic entirely.

In the context of microfinance, financial knowledge—understanding interest rates, contract terms, and operational structures—acts as an informational equalizer. Drawing upon Agency Theory and the concept of Information Asymmetry, members with higher financial knowledge are better equipped to comprehend and evaluate the strategic decisions made by cooperative leadership. Because they understand the "mechanics" of the institution, they do not rely on blind faith; instead, they develop *calculus-based trust*. They can objectively verify that the leadership is acting with competence and integrity. Once this cognitively grounded trust is established, it significantly reduces perceived risks, encouraging members to engage in sustainable financial behaviors, such as consistent saving and disciplined loan repayment, which ultimately drive the institution's financial sustainability.

Financial skills represent practical capabilities, such as personal budgeting, cash flow management, and mitigating immediate financial distress. A member's practical ability to manage their own money operates independently of their relational dynamic with institutional leadership. While robust financial skills directly empower a member to fulfill their financial obligations (directly impacting sustainability), this process does not fundamentally require "institutional trust" as a bridge. The execution of a personal budget is an internal behavioral mechanism, not a relational one. Therefore, while skills are vital for sustainability, their impact bypasses the psychological conduit of leadership trust. Financial culture encompasses the shared values, communal norms, and socialized behaviors within a

community. While a strong, localized culture might naturally foster a generalized, *affective trust* (an emotional bond or communal solidarity) toward local cooperative leaders, this specific type of trust lacks the structural rigor required to drive *financial* sustainability.

5. Conclusion and Suggestion

This study bridges existing literature gaps by validating the structural determinants of microfinance sustainability within the Indonesian cooperative sector. The results emphasize that to secure long-term institutional financial sustainability, grassroots microfinance institutions must prioritize the enhancement of practical financial skills and objective financial knowledge among their members. Fostering robust trust in cooperative leadership acts as a vital mechanism that translates this literacy into tangible sustainability outcomes. The empirical findings reveal that cognitive and practical competencies—specifically financial skills and financial knowledge—exert significant positive associations with both perceived financial sustainability and trust in institutional leadership on both financial sustainability and trust in institutional leadership. Notably, trust in institutional leadership not only directly enhances financial sustainability but also serves as a crucial mediating variable that effectively translates financial knowledge into improved literacy outcomes. Conversely, while a robust financial culture successfully fosters trust in cooperative leadership, it does not demonstrate a significant direct or indirect influence on financial sustainability. Furthermore, the data indicates that institutional trust does not significantly mediate the relationships between financial skills, financial culture, and financial sustainability. These associative insights carry important practical implications for the microfinance sector. While this study relies on perceptual data rather than objective default rates, the robust statistical link between member skills and institutional trust suggests that policymakers and MFI managers should consider prioritizing targeted financial capability training. Cultivating these practical skills may serve as a highly effective strategy to mitigate perceived operational risks and support broader institutional resilience. By systematically strengthening these specific competencies, MFIs can directly advance their members' financial sustainability while simultaneously solidifying trust in institutional governance. Ultimately, identifying and optimizing these critical variables is essential for community-based financiers to maintain long-term financial sustainability, drive inclusive economic empowerment, and effectively uplift underserved populations.

6. Limitations and Future Research

While this study provides robust empirical insights, certain limitations must be acknowledged, specifically concerning the selected methodology and external validity. First, the reliance on a cross-sectional survey design (a methodological limitation) restricts the ability to establish absolute longitudinal causality between the acquisition of financial skills and the reduction of institutional default rates over time. This is not a structural error in the research execution, but an inherent limitation of the selected cross-sectional method, meaning the results capture a specific economic snapshot rather than a continuous evolutionary trend.

Second, regarding external validity, the sampling frame is geographically and institutionally constrained. The data was clustered among active cooperative members primarily located in North Sumatra, involving a specific subset of cooperative institutions. This regional concentration limits the immediate generalizability of the findings to the national level, as the results may heavily reflect specific local socio-cultural dynamics (such as the localized

interpretation of the constitutional mandate of *asas kekeluargaan* or kinship). Consequently, these relational trust mechanisms and financial behaviors might operate differently in MFI ecosystems across other Indonesian provinces or differing emerging economies. To address these validity constraints, future researchers are encouraged to employ longitudinal research designs to capture the temporal dynamics of how financial skills impact financial stability across multiple economic cycles. Additionally, subsequent studies could expand this model by integrating macroeconomic moderating variables—such as regional inflation rates or the pace of local digital fintech adoption (e.g., QRIS integration)—to evaluate how external economic shocks influence the mediating strength of institutional trust in different global contexts.

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Declaration of AI and AI-assisted technologies in the writing process

During the preparation of this work, the author(s) used AI-assisted technologies (e.g., ChatGPT / Gemini) in order to assist with language refinement, proofreading, and structuring academic ideas to support the research writing process. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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