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MEASURING FINANCIAL INCLUSION IN SMES: A PATHWAY TO STRENGTHENING FINANCIAL RESILIENCE

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ABSTRAK

Pembiayaan krusial bagi keberlangsungan usaha, terutama UKM yang sering terkendala akses pinjaman karena agunan dan riwayat kredit terbatas. Penelitian ini menganalisis pengaruh literasi keuangan, perilaku keuangan, risiko keuangan, dan teknologi keuangan terhadap inklusi keuangan UKM di Kabupaten Gianyar, Bali. Sebanyak 100 (seratus) UKM dipilih secara purposive melalui pendekatan kuantitatif. Data dihimpun via kuesioner terstruktur dan diolah menggunakan SmartPLS 4 dengan PLS-SEM. Hasil menunjukkan literasi, perilaku, pengelolaan risiko, serta pemanfaatan teknologi keuangan meningkatkan inklusi bila dikelola baik; namun risiko keuangan signifikan menghambat adopsi fintech. Temuan menegaskan pentingnya kompetensi keuangan dan mitigasi risiko untuk memperluas akses layanan formal. Riset mengintegrasikan Financial Inclusion Theory dan Financial Resilience Theory, menyoroti peran adopsi fintech dalam memperkuat stabilitas keuangan UMKM, serta mendorong pertumbuhan usaha berkelanjutan di daerah tersebut.

Kata Kunci: Inklusi keuangan, financial technology, literasi keuangan, perilaku keuangan, risiko keuangan, ketahanan keuangan

ABSTRACT

Financing is vital to business performance because it secures funds for projects and operations. For Small and Medium Enterprises (SMEs), access to credit is constrained by weak collateral and limited credit histories. This study examines how financial literacy, behavior, risk, and financial technology affect financial inclusion among SMEs in Gianyar Regency, Bali. Using a quantitative design, we purposively sampled 100 SMEs based on location, fintech adoption, and operating history. Data were collected via a questionnaire and analyzed with SmartPLS 4 using PLS-SEM. Results indicate financial knowledge, behavior, risk management, and fintech enhance inclusion, but risk hinders fintech adoption. These findings highlight that financial competence and risk mitigation are crucial to accessing formal financial services. Integrating Financial Inclusion Theory and Financial Resilience Theory, it argues that fintech adoption can strengthen SMEs' financial stability. Policymakers and financial institutions should advance financial literacy, prudent conduct, and risk reduction to build more inclusive ecosystems.

Keywords: Financial inclusion, financial technology, financial literacy, financial behavior, financial risk, financial resilience

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1. Introduction

Financing is a key element that significantly affects a business's seamless functioning. It acts as a means to secure capital, which is then directed toward the execution of various company projects or initiatives. This capital typically originates from external financial sources, including banks and other financial institutions (Hakim et al., 2022). Financing serves as an essential source of financing necessary for the company's operating activities, encompassing infrastructure development, construction projects, and corporate initiatives (Kilay et al., 2022). Thus, sufficient financing allows organizations to function more effectively and efficiently, while also improving long-term commercial capacities. Consequently, meticulous preparation is needed to guarantee that the firm can expand and prosper when effectively administered (Wilantini, 2021). In any enterprise, funding is essential, as commercial activities necessarily necessitate funds to maintain operations. Insufficient capital may hinder a business's optimal functioning and potentially lead to its failure (Gupta et al., 2025).

Financing for Small and Medium Enterprises (SMEs) has unique characteristics. Small and medium-sized enterprises frequently face considerable obstacles in securing financing due to inadequate collateral and a lack of credit history (Abdurohim Dindin, 2023). Financing sources for SMEs are often classified into two categories: internal and external sources. Internal financing encompasses investments from asset sales, inventory reduction, and retained earnings. In contrast, external financing pertains to loans that are obtained from creditors and may be classified as short-term, medium-term, or long-term. Nonetheless, numerous funding alternatives exist for SMEs. One option is microloans offered by microfinance organizations or cooperatives, which often present more flexible criteria and can be customized to address the specific needs of SMEs (Natalia et al. 2022). Small and Medium Enterprises (SMEs) constitute the predominant business category in Indonesia, comprising 99.9% of all company entities in the nation, with an estimated 64.2 million enterprises (Purnomo et al., 2024).

Small and Medium Enterprises (SMEs) contribute significantly to economic growth acceleration, especially in developing nations like Indonesia (Anisyah et al., 2021). Due to their ability to assimilate a greater proportion of the labor force than other types of enterprises, they are one of the primary supporting pillars of the national economy (Novitasari, 2022). Data from the Ministry of Cooperatives indicates that, as of 2023, Indonesia has 64.2 million SMEs, which contribute around 61.07% to the national Gross Domestic Product (GDP), amounting to IDR 8,573.89 trillion. SMEs employ roughly 117 million individuals, constituting 97% of the total labor force, and represent about 60.4% of overall investment. These statistics highlight the significant role of SMEs in Indonesia's comprehensive economic advancement (Mahfirah et al., 2023).

The contribution of SMEs to the economy is seen in both national and regional income across several provinces in Indonesia, including Bali. The number of SMEs in Bali has steadily risen during the last five years. Between 2017 and 2023, the growth of SMEs in Bali was documented at 41.50%, resulting in the establishment of 129,991 new firms. In 2023, the Bali Provincial Office of Cooperatives recorded a total of 440,675 registered SMEs, consisting of 107,656 formal-sector enterprises (24.31%) and 335,192 informal-sector enterprises (75.69%) (Wahyuni Sari, 2023). Gianyar Regency stands out as one of

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the regencies in Bali with a significant concentration of household industries or SMEs. Data from the Bali Provincial Office of Cooperatives indicates that the total number of SME units in Gianyar has reached 75,666. Moreover, the advancement of SMEs in Gianyar Regency is perceived as notably robust, showcasing considerable progress. The total number of SMEs actively operating in Gianyar Regency as of 2023 is 25,639. This figure includes 22,623 small enterprises and 3,016 medium enterprises. Moreover, Sukawati District possesses the greatest concentration of SMEs in Gianyar Regency, with 4,453 registered units.

The number of actively operating SMEs in Gianyar Regency is relatively high, and their growth trend is positive; however, SME actors in Gianyar face significant challenges. Numerous developing SMEs face significant challenges, particularly in obtaining sufficient financing for business growth. SMEs typically face challenges in growth due to restricted capital and obstacles in obtaining funding, which ultimately impede business development (Mandala et al. 2025). Consequently, it is essential to improve financial inclusion for SME participants in Gianyar Regency. Financial inclusion, in this context, denotes enhanced access to affordable financial services specifically designed to meet the needs of SMEs in the region.

Financial inclusion refers to the availability of accessible financial products and services that are affordable, suitable for users' needs and capacities, and effective in addressing the financial requirements of the population. The objective is to remove obstacles to service access from formal financial institutions, particularly targeting groups with restricted access to formal financial systems, to enhance overall societal well-being (Pratiwi, 2023).

The emergence of technology innovation is anticipated to enable the development of more economical and accessible financial products and services (Setiawan et al., 2021). Facilitated access to financial services via digital applications has allowed previously unbanked and financially marginalized SME participants to become more knowledgeable and empowered in utilizing these services (Kodongo, 2024). A significant technological advancement pertinent to the requirements of SMEs is financial technology (fintech), which provides more accessible and cost-effective financing options. Fintech services enable SMEs to secure loans or credit via expedited, streamlined procedures, frequently at reduced prices relative to conventional banks. Consequently, SMEs can secure increased financing to augment production and develop their enterprises, thereby improving business sustainability and fostering financial inclusion (Wati et al., 2020). Research by (Djakaria et al, 2023) and (Aracil et al., 2025) indicates that financial inclusion is affected by multiple factors, such as financial literacy, financial behavior, and financial risk. Furthermore, research by (Ainiyah et al. 2022) demonstrates that the implementation of financial technology is a crucial determinant of financial inclusion.

Financial literacy defines an individual's capacity to comprehend financial concepts and risks, cultivate pertinent skills, and foster the confidence required to make educated decisions that enhance personal financial well-being (Morgan et al. 2020). Financial literacy enables individuals to improve their knowledge and abilities in efficient financial management (Chauhan & Dey, 2020). Furthermore, financial literacy enables individuals to acknowledge the significance of utilizing financial items and services. This is consistent

with research by (Mandala et al. 2025) and (Lusiana et al., 2025), which demonstrated that financial literacy significantly enhances the financial inclusion of SMEs. Nevertheless, studies conducted by (Mauliddah,2024) reveal divergent results, suggesting that financial literacy does not significantly affect the financial inclusion of SMEs (García Mata, 2021).

Alongside financial literacy, financial behavior also impacts the financial inclusion of SMEs. Financial conduct pertains to an individual's behaviors in managing monetary resources in everyday life, encompassing the utilization and allocation of accessible financial assets. It also demonstrates an individual's fiscal responsibility in properly managing finances (Mbere et al. 2024). Financial behavior is essential to financial inclusion, as it includes attitudes, habits, and activities pertaining to financial management (Grohmann et al., 2018). In this context, financial behavior influences the manner in which SMEs access and utilize accessible financial services. (Aracil et al., 2025) found a substantial positive correlation between financial conduct and SME financial inclusion. Conversely, a study by (Djakaria et al, 2023) posits that financial conduct does not substantially affect the financial inclusion of SMEs (Garg & Singh, 2018).

The advancement of financial inclusion is also affected by other variables, including the rise of technology advancements anticipated to produce more affordable and accessible financial products and services (Wati et al., 2020). The emergence of financial technology necessitates that SME stakeholders commence the adaptation of technology inside their business operations (Wati et al., 2020). This integration ultimately improves access to financial services, such as credit, funding, and loans, by simplifying and optimizing the financial service process using fintech solutions (Hayashi & Routh, 2025).

The potential loss that individuals, companies, or institutions may experience as a consequence of financial decision-making is referred to as financial risk (Li & Li, 2025) (Wang et al., 2024). It incorporates a variety of risks, such as credit risk, market risk, operational risk, legal risk, and liquidity risk (Duan et al., 2025). Financial risk might affect financial inclusion due to the unpredictability and possible losses linked to financial operations (Pohan et al. 2022). Individuals exposed to financial risk exhibit increased caution in the utilization of financial services (Veronica & Indrawan, 2024). The findings of (Mayasari et al., 2023) indicate that financial risk significantly enhances the financial inclusion of SMEs. Conversely, (Pohan et al. 2022) reported that financial risk does not substantially influence financial inclusion.

This study addresses a critical gap in understanding the joint effects of financial literacy, financial behavior, financial risk, and financial technology on SMEs' financial inclusion, particularly in developing regions such as Gianyar Regency, Bali, where prior research has tended to examine these factors in isolation and has produced inconsistent findings. To resolve these inconsistencies and capture the interrelationships among determinants, the study proposes and tests a comprehensive model that integrates Financial Inclusion Theory and Financial Resilience Theory, thereby simultaneously assessing direct and indirect pathways through which these variables shape SMEs' access to formal financial services. The key novelty lies in this theoretical integration and holistic specification, which positions fintech adoption as a central mediating mechanism linking literacy, behavior, and risk management to enhanced inclusion and resilience, offering a unified framework that advances both conceptual clarity and empirical insight.

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Theoretically, this study contributes to expanding Financial Inclusion and Financial Resilience theories by demonstrating how fintech adoption, moderated by financial literacy and risk management, strengthens SMEs' financial stability and inclusion. Practically, it offers insights for SME owners to enhance financial competence, adopt responsible financial behavior, and mitigate risks to improve access to formal financial services. From a policy perspective, the findings guide policymakers and financial institutions to design inclusive financial ecosystems by promoting financial literacy programs, building fintech trust and infrastructure, and developing risk-mitigation frameworks that encourage broader participation in formal financial systems. Together, these contributions foster a more inclusive and resilient SME financial landscape in developing economies.

2. Literature Review and Hypotheses Development

According to Amartya Sen in his seminal work *Development as Freedom*, the theory of financial inclusion is grounded in the capability approach, which defines financial inclusion as equitable and fair access to financial services that enable individuals to expand their capabilities in achieving a meaningful and valuable life. This theory emphasizes the critical role of financial access in reducing socio-economic disparities and empowering marginalized communities to improve their overall well-being. The term "financial inclusion" has gained increasing popularity among the public due to its significance in supporting sustainable development, although its meaning is not yet fully understood by many. In fact, numerous daily financial activities are, often unknowingly, part of financial inclusion practices.

Durai et al. (2019) define financial inclusion as the process of ensuring access to financial services and credit for vulnerable and low-income groups at an affordable cost. Similarly, Holle, (2019) describes financial inclusion as the ability of individuals or groups to obtain access to formal financial products and services that are useful, affordable, and capable of meeting their needs, such as transactions, savings, credit, and insurance in a responsible and sustainable manner. Yanti (2019) further adds that financial inclusion occurs when all members of society have access to financial products and services.

The concept of financial resilience underscores institutional and political strategies for establishing a more robust financial system, beyond a solely economic perspective. This theory fundamentally examines the motivations and knowledge constraints of financial actors, promoting a polycentric governance approach and robust institutional design principles, as articulated by Elinor Ostrom in 2009. The main goal is to establish regulations that synchronize individual incentives with overall financial stability while acquiring the requisite understanding to govern intricate financial systems, thereby contesting the more centralized "microprudential" and "macroprudential" methodologies (Salter et al. 2018).

The financial resilience concept is pertinent to research on financial inclusion, especially studies investigating factors such as financial technology (fintech), financial literacy, and financial risk. It offers a valuable perspective for comprehending how individuals and organizations can adjust to change, augment financial literacy, mitigate financial risks, elevate quality of life, and foster both financial system stability and economic progress. This idea provides a more expansive and thorough viewpoint on

enhancing financial inclusion via fintech uptake, financial literacy enhancement, and the execution of appropriate risk management methods (Wulandari et al., 2023).

Financial literacy is the capacity of an individual to effectively manage current and prospective financial conditions (Purwidianti et al., 2022). It is regarded as a crucial remedy for assisting persons in circumventing financial hardships (Lestari et al., 2023). Financial literacy consists of financial knowledge, financial planning, and financial management skills, which are utilized by SME actors to facilitate business growth (Pusporini, 2020). The improvement of financial literacy is to empower individuals, particularly those with constrained financial acumen, to make more informed financial decisions, including prudent investing, saving, and credit card management (Cucinelli & Soana, 2023). It aids individuals in comprehending, assessing, and behaving in accordance with their financial best interests (Kerthayasa et al. 2023). Individuals possessing a high degree of financial literacy are more adept at understanding the financial ramifications of their choices and formulating more efficient financial planning strategies (Apriliani et al. 2023).

Financial inclusion is the term used to describe the public's access to a diverse array of financial institutions, products, and services that are in accordance with the population's requirements and capabilities (Kusuma et al., 2022). The principal objective of financial inclusion is to improve public access to financial products and service providers and to encourage more effective and efficient use of those services. In this context, financial inclusion facilitates individuals' access to financial services more readily and extensively, while enhancing their capacity to handle funds efficiently (Satria et al. 2024).

The proficient application of financial technology (fintech) necessitates a robust level of financial literacy, allowing individuals to comprehend essential financial principles such as budgeting, income management, and debt regulation, in addition to effectively employing fintech tools for financial management (Apriliani et al. 2023). Financial literacy augments individuals' ability to embrace fintech, hence fostering financial inclusion, particularly among vulnerable and low-income populations, as highlighted by (Ozili, 2020), (Durai et al. 2019), (Holle, 2019), and (Yanti, 2019). These researchers emphasize that financial inclusion entails providing access to cheap and responsible financial services for all societal groups. According to Financial Resilience Theory, financial literacy enhances individuals' capacity to handle financial risks, along with the polycentric governance model that promotes inclusive institutional management and effective fintech application (Salter et al. 2018). Empirical research from (Putri et al, 2022) substantiates this perspective, indicating a considerable positive correlation between financial literacy and the utilization of financial technology. Based on the description, the following hypothesis is formulated:

H_1: Financial literacy has a positive effect on financial technology**.**

An individual's capacity to effectively utilize financial technology (fintech) can be improved by engaging in positive financial behavior, including the ability to make sound financial decisions, effectively manage finances, and possess strong financial literacy (Saputra et al. 2022). This behavior enhances financial inclusion by facilitating easier, more secure, and affordable access to formal financial services for individuals, especially

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those from vulnerable and low-income demographics (Ozili, 2020), (Durai et al. 2019), (Holle, 2019), and (Yanti, 2019). Financial behavior is essential for promoting financial inclusion and enabling users to utilize fintech solutions responsibly. According to Financial Resilience Theory, prudent financial behavior enhances people's ability to manage financial risks and uncertainties, underscoring the need for inclusive institutional management from a polycentric governance viewpoint (Salter et al. 2018). Empirical research from (Saleh et al. 2025) substantiates that financial conduct exerts a favorable and significant influence on the adoption of financial technology. Based on the description, the following hypothesis is formulated:
H_2: Financial behavior has a positive effect on financial technology**.**

Financial technology involves inherent financial and technological risks, including credit, operational, liquidity, and reputational risks, as well as risks related to cybercrime and payment defaults. Effective risk management, adapted to cost-efficiency considerations, is essential to maintaining secure and trustworthy fintech services, especially for financially vulnerable groups (Ozili, 2020). Poorly managed financial risk can undermine public trust in fintech and hinder efforts toward financial inclusion. As noted by (Durai et al. 2019), financial inclusion ensures access to affordable financial services and credit for low-income and vulnerable groups, while (Holle, 2019) and (Yanti, 2019) emphasize responsible, sustainable access to formal financial products. Within the framework of Financial Resilience Theory, proper financial risk management strengthens individual and societal resilience, supported by a polycentric governance approach that promotes inclusive risk frameworks, particularly in fintech contexts. The following hypothesis is formulated in accordance with the description:
H_3: Financial risk has a positive and significant effect on financial technology.

Equipping individuals with the knowledge and skills required to effectively manage their finances is a critical function of financial literacy. Proficient financial literacy empowers individuals to comprehend the significance of utilizing financial products and services customized to their requirements, thus fostering financial inclusion. It promotes the utilization of formal financial instruments for budgeting, investment, and future planning. (Ozili, 2020) defines financial inclusion as the provision of affordable financial services to low-income populations. Financial literacy enables individuals to comprehend and effectively employ official financial services, hence enhancing their access to safer and more organized options in contrast to informal alternatives. In the context of Financial Resilience Theory, financial literacy is a fundamental component of the development of individual and community resilience by promoting informed and responsible financial decision-making, particularly among vulnerable populations (Salter et al. 2018). (Lusiana et al., 2025) substantiate this perspective, demonstrating that financial literacy significantly enhances the financial inclusion of SMEs. In light of the above discourse, the subsequent hypothesis is proposed:
H_4: Financial literacy has a positive effect on financial inclusion.

The uncertainty and potential losses associated with financial activities can have a substantial impact on financial inclusion, which is a result of financial risk. In order to

promote a more sustainable and inclusive financial system, it is imperative to optimize risk mitigation initiatives in conjunction with consumer protection and financial literacy enhancement (Pohan & Nurhamid, 2022). (Ozili, 2020) posits that financial inclusion entails providing cheap access to financial services for low-income and marginalized populations. Effective risk management empowers persons from these demographics to utilize formal financial services with assurance, devoid of the apprehension of significant loss. (Ozili, 2020), (Durai et al. 2019), (Holle, 2019), and (Yanti, 2019) collectively assert that inclusive finance offers responsible and affordable access to advantageous financial products and services for all societal members. In the context of Financial Resilience Theory, proficient risk management is crucial in fostering resilience at both individual and institutional tiers. The theory's polycentric governance viewpoint emphasizes the necessity for concerted institutional initiatives to enhance access to formal financial services, particularly for vulnerable groups, while bolstering the integrity of the financial system (Salter et al. 2018). (Mayasari et al., 2023) demonstrated that financial risk significantly enhances the financial inclusion of SMEs. The following hypothesis is formulated in light of the aforementioned discussion:

H_5: Financial risk has a positive effect on financial inclusion.

The use of financial technology (fintech) as a funding source offers several advantages, including broader accessibility and the convenience of applying for loans online without face-to-face interaction. Fintech lending processes are typically faster and more efficient; however, they also carry financial risks, particularly credit risk. Therefore, borrowers must carefully assess their repayment capacity to minimize potential risks (Trimulato, 2022). According to (Ozili, 2020), financial inclusion involves ensuring effective access to financial services, especially for low-income and underserved populations. Fintech's ability to reach wider audiences and deliver digital financial services efficiently makes it a powerful tool for expanding financial access and promoting inclusion. (Durai et al. 2019), (Holle, 2019), and (Yanti, 2019) similarly emphasize that financial inclusion ensures that vulnerable and low-income groups can access affordable, beneficial, and responsible financial services such as savings, credit, transactions, and insurance. In the context of Financial Resilience Theory, effective risk management supports financial resilience by creating inclusive institutional frameworks that ensure continued access to financial services, particularly for vulnerable groups, thereby strengthening overall financial system stability (Salter et al. 2018). This is supported by findings from (Pitri, 2023) and (Putri et al., 2023), which confirm that financial technology has a positive and significant effect on financial inclusion. According to the preceding discourse, the subsequent hypothesis is proposed:

H_6: Financial technology has a positive effect on financial inclusion.

3. Research Method

This study was performed on SMEs situated in Gianyar Regency, Bali, chosen for having the largest concentration of SMEs in the province. Data from the Gianyar Regency Office of Cooperatives for the year 2023 indicates the presence of 4,453 SMEs; however, the precise number employing financial technology remains unspecified. The research

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utilized purposive sampling based on the following criteria: (1) SMEs located in Gianyar Regency, (2) operational for a minimum of one year, and (3) having integrated fintech into their business practices. The sample size was calculated using Hair's technique (Hair, 2017). This study employed a total of 20 indicators; therefore, the sample size was determined using the formula 20 × 5 = 100 samples. The multiplication factor of five was applied because the number of indicators used was fewer than 100. This approach was adopted to ensure that the selected sample size was sufficiently representative and possessed adequate statistical power for the analysis. This study employed quantitative data to evaluate the presented hypotheses, using primary data gathered directly from SME participants through a standardized questionnaire. A five-point Likert scale was employed, spanning from "strongly agree" to "strongly disagree." The investigation utilized the Partial Least Squares (PLS) method, a variance-based structural equation modeling (SEM) technique. The analysis had two phases: the measuring model (outer model) to assess validity and reliability, and the structural model (inner model) to investigate causal links among latent variables grounded in substantive theory.

Table 1 presents the operational definitions of the variables used in this study, which serve as a foundation for measuring and analyzing each construct in accordance with the research objectives. The operational definitions clarify the conceptual boundaries of the variables, specify the indicators employed to quantify them, and ensure consistency in interpretation throughout the data collection and analysis process. By clearly defining each variable, such as financial literacy, financial behavior, financial risk, financial technology, and financial inclusion, this study establishes a systematic framework that enhances the reliability and validity of the measurement model. These definitions also facilitate a better understanding of the interrelationships among variables, allowing for more precise hypothesis testing and robust empirical conclusions.

Table 1. Variable Measurement

Variable	Measurement	Sources
Financial Literacy	1. Basic financial knowledge 2. Savings and loans 3. Insurance 4. Investment	(Sugiharti et al. 2019)
Financial Behavior	1. Financial planning 2. Financial budgeting 3. Financial management 4. Financial recordkeeping	(Winarto, 2020)
Financial Technology	1. Convenience 2. Security 3. Usefulness 4. Efficiency	(Winarto, 2020)
Financial Inclusion	1. Access dimension 2. Usage dimension 3. Quality dimension 4. Welfare dimension	(Sanistasya et al. 2019)

The outer model or measurement model analysis illustrates the relationship between latent variables and their indicators. This analysis is conducted to ensure that the measurement instruments used are valid and reliable indicators of the constructs being assessed. The validity test is carried out using two approaches, namely convergent validity and discriminant validity, while reliability testing is conducted through Cronbach's alpha and composite reliability.

Convergent validity is an indicator assessed based on the correlation between the item score or component score and the construct score, as reflected by the standardized loading factor, which indicates the degree of correlation between each measurement item (indicator) and its construct. An individual reflective measure is considered high if it correlates above 0.70 with the construct it intends to measure. According to Ghozali (Ghozali, 2021), outer loading values between 0.50 and 0.60 are still acceptable. In addition to examining the outer loading or loading factor values, convergent validity can also be evaluated by considering the outer loadings of the indicators and the Average Variance Extracted (AVE). A model is considered to have satisfactory convergent validity if the AVE value (square of Average Variance Extracted) exceeds 0.50, indicating that, on average, the construct explains more than half of the variance of its indicators.

Discriminant validity identifies the extent to which a concept is genuinely separate from other constructs within a model. It evaluates whether concepts or measurements that are intended to be unconnected are genuinely unrelated. The Fornell-Larcker criterion compares the square root of the Average Variance Extracted (AVE) of each construct with the correlations between that construct and other constructs in the model (Ghozali, 2021).

Reliability assesses how consistently the indicators measure the latent constructs they are associated with. In simple terms, it ensures that the indicators used to measure a construct are reliable and provide consistent results. Composite Reliability is a measure of internal consistency that assesses how well the indicators represent the latent construct. Composite Reliability values should typically be 0.70 or higher for adequate reliability, though values between 0.60 and 0.70 are acceptable in exploratory research. Cronbach's Alpha is a traditional measure of reliability that assesses how closely related the indicators are as a group. It assumes equal loadings for all indicators. Alpha values should be 0.70 or higher for adequate reliability, but a value between 0.60 and 0.70 may be acceptable in exploratory studies (Ghozali, 2021). The mathematical equation for the outer model is shown in the model below.

$$xij = \lambda ij\eta i + \delta ij$$

Annotation :
xij = indicator j for construct i
λij = loading
δij = measurement error

The inner model or structural model analysis is used to predict causal relationships among latent variables. The structural model illustrates the interrelationships between latent variables that have been developed based on substantive theory. The assessment of the structural model in PLS begins by examining the R-square value for each endogenous

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latent variable, which indicates the predictive power of the structural model. The R-square result represents the proportion of variance in the construct explained by the model. The rule of thumb for interpreting R-square values is as follows: values of 0.75, 0.50, and 0.25 indicate that the model has strong, moderate, and weak predictive power, respectively (Ghozali, 2021).

The path coefficient test is conducted using the bootstrapping method to assess the significance of the relationships among constructs by examining the parameter coefficients and T-statistic significance values. The path coefficients are evaluated using a threshold value above 0.1, indicating that the specified path has a meaningful influence within the model. Significance was assessed via T-statistics and p-values to test the effects of exogenous variables on endogenous variables, using SmartPLS 4.0 with bootstrapping. The bootstrap procedure resamples the full original dataset; 200–1,000 bootstrap samples are adequate to correct PLS standard errors (Ghozali, 2021). Hypotheses were evaluated with a one-tailed critical value of t = 1.64 at α = 0.05. The mathematical equation for the inner model is presented in the model below.

$$\eta j = \sum_{i=1}^{m} \gamma ji\xi i + \sum_{k=1}^{n} \beta jk + \zeta j$$

Annotation :

ηj = endogenous latent variable

ξ_i= exogenous latent variable

β_{jk}= path coefficient from endogenous latent variable $\eta_k \rightarrow \eta_j$

γ_{ji}= path coefficient from exogenous latent variable $\xi_i \rightarrow \eta_j$

ζ_j= error term (disturbance)

4. Results and Discussion

According to the questionnaire findings, the individuals who participated in this research were classified into various categories based on several factors. These characteristics included the type of business, the location of the business, and the number of years of operation.

Categorization of SME respondents according to their business type. Of the 100 responders, the predominant sector is handicrafts at 39%, followed by culinary companies at 25%, fashion at 20%, and grocery stores at 16%. This indicates that handicrafts constitute the predominant business category among SMEs in the sample, underscoring the sector's significance in the local economy. The results underscore the range of SME operations while highlighting the crucial importance of traditional industries, like handicrafts and culinary enterprises, in the region.

Sukawati District exhibits the highest concentration of SME respondents in Gianyar Regency, with 38% of the total respondents doing their operations in this region. The significant proportion of SMEs in Sukawati likely indicates the district's economic potential and appeal to entrepreneurs, especially in handicrafts industries, which are prevalent in the area. SME respondents are based on the number of years their businesses

have been in operation. The largest group, comprising 38% of respondents, has been operating for 1–5 years, indicating a significant proportion of relatively new businesses. This is followed by 24% of respondents whose businesses have been operating for more than 10 years, 20% for more than 20 years, and 18% for more than 5 years. The data reflect a diverse range of business experience among the SMEs surveyed, with both newly established and long-standing enterprises represented, highlighting the varying needs and challenges these businesses may face in adopting financial technology and accessing financial services.

Table 2. Respondent Demographics

Characteristics		Frequency	Percentage
Type of Business			
- Handicrafts		39	39%
- Fashion		20	20%
- Culinary		25	25%
- Grocery Store		16	16%
	Total	100	100%
Location			
- Gianyar City		15	15%
- Sukawati Regency		38	38%
- Ubud Regency		17	17%
- Tegallalang Regency		11	11%
- Blahbatuh Regency		5	5%
- Tampaksiring Regency		7	7%
- Payangan Regency		7	7%
	Total	100	100%
Years of Operation			
- 1 – 5 years		38	38%
- > 5 years		18	18%
- > 10 years		24	24%
- > 20 years		20	20%
	Total	100	100%

Source: Authors (2024)

The outer model was evaluated for its validity and dependability. Validity assessment encompassed convergent and discriminant validity, and reliability was evaluated by composite reliability and Cronbach's alpha. Convergent validity is evaluated by examining the correlation between an item or component score and its corresponding construct score, as represented by the standardized loading factor, which shows how strongly each measurement indicator is associated with its construct. A reflective indicator is regarded as adequate when it exhibits a correlation greater than 0.60 with the construct it measures.

Table 3. Outer Loading Result

No	Variable	Indicator	Loading Factor	Rule Of Thumb	Description
1	Financial Technology	FT.1	0.913	> 0.600	Valid
		FT.2	0.798	> 0.600	Valid
		FT.3	0.898	> 0.600	Valid
		FT.4	0.752	> 0.600	Valid
2	Financial Inclusion	LK.1	0.836	> 0.600	Valid

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No	Variable	Indicator	Loading Factor	Rule Of Thumb	Description
		LK.2	0.875	> 0.600	Valid
		LK.3	0.779	> 0.600	Valid
		LK.4	0.847	> 0.600	Valid
3	Financial Literacy	LK.1	0.852	> 0.600	Valid
		LK.2	0.807	> 0.600	Valid
		LK.3	0.748	> 0.600	Valid
		LK.4	0.794	> 0.600	Valid
4	Financial Behavior	PK.1	0.738	> 0.600	Valid
		PK.2	0.735	> 0.600	Valid
		PK.3	0.919	> 0.600	Valid
		PK.4	0.919	> 0.600	Valid
5	Financial Risk	RK.1	0.863	> 0.600	Valid
		RK.2	0.823	> 0.600	Valid
		RK.3	0.883	> 0.600	Valid
		RK.4	0.897	> 0.600	Valid

Source: Authors (2024)

The analysis results demonstrate that all indicators for the variables of Financial Literacy, Financial Behavior, Financial Risk, Financial Technology, and Financial Inclusion have satisfied the validity criteria, with loading factors surpassing 0.600. The convergent validity of the measuring model is assessed by the correlation between item/instrument scores and their respective construct scores (loading factor). The optimal loading factor for each instrument should be above 0.7; still, a minimum acceptable barrier is greater than 0.6. In specific settings, such as the creation of new measuring scales, loading factors under 0.6 may be deemed appropriate (Ghozali, 2021).

Table 4. Average Variance Extracted Result

Variable	Average Variance Extracted (AVE)
Financial Technology	0.711
Financial Inclusion	0.697
Financial Literacy	0.642
Financial Behavior	0.693
Financial Risk	0.752

Source: Authors (2024)

Following the evaluation of Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE) for each indicator within the variables of Financial Literacy, Financial Behavior, Financial Risk, Financial Technology, and Financial Inclusion, the next step is to assess the construct validity of each variable. A model is considered to have adequate convergent validity if the AVE value exceeds 0.50 (Ghozali, 2021). This indicates that, on average, the construct explains more than half of the variance of its indicators. The detailed AVE values for each variable are presented as follows:

The Average Variance Extracted (AVE) threshold has been met by all variables, as evidenced by Table 3, with values exceeding 0.50. As a result, the measurement model employed in this investigation is deemed sufficient, and its indicators are demonstrated to consistently represent their respective constructs.

Table 5. Cross Loading Result

	Financial Technology	Financial Inclusion	Financial Literacy	Financial Behavior	Financial Risk
FT.1	**0.913**	0.432	0.381	0.530	0.185
FT.2	**0.798**	0.586	0.598	0.688	0.484
FT.3	**0.898**	0.426	0.364	0.520	0.166
FT.4	**0.752**	0.318	0.376	0.526	0.273
IK.1	0.355	**0.836**	0.609	0.549	0.498
IK.2	0.459	**0.875**	0.532	0.687	0.452
IK.3	0.495	**0.779**	0.529	0.679	0.384
IK.4	0.497	**0.847**	0.577	0.621	0.466
LK.1	0.540	0.578	**0.852**	0.535	0.434
LK.2	0.409	0.547	**0.807**	0.447	0.478
LK.3	0.284	0.459	**0.748**	0.278	0.291
LK.4	0.416	0.563	**0.794**	0.467	0.462
PK.1	0.461	0.798	0.502	**0.738**	0.502
PK.2	0.496	0.777	0.479	**0.735**	0.466
PK.3	0.648	0.527	0.446	**0.919**	0.603
PK.4	0.648	0.527	0.446	**0.919**	0.603
RK.1	0.271	0.564	0.474	0.565	**0.863**
RK.2	0.218	0.499	0.476	0.502	**0.823**
RK.3	0.345	0.395	0.432	0.600	**0.883**
RK.4	0.373	0.398	0.438	0.610	**0.897**

Source: Authors (2024**)**

The loading values of each indicator item on its corresponding construct exceed their cross-loading values on alternative constructions, as indicated in the table provided. Consequently, it may be asserted that all constructs or latent variables have satisfied the criterion for robust discriminant validity. This suggests that the indications inside each build block more effectively elucidate their corresponding construct than those from other construct blocks.

Reliability gauges the consistency of indicators in measuring their latent constructs. Composite reliability tests internal consistency—how well indicators represent a construct—with ≥0.70 preferred (0.60–0.70 acceptable in exploratory work). Cronbach's alpha, assuming equal loadings, also evaluates inter-item coherence; ≥0.70 is desirable, though 0.60–0.70 can suffice for exploratory studies. Based on Table 6, all constructs have values greater than 0.6, indicating that construct validity has been achieved. This suggests that the constructs are reliable, as a valid construct must also demonstrate reliability.

Table 6. Cronbach's Alpha and Composite Reliability

Variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Description
Financial technology	0.863	0.877	0.907	Reliable
Financial Inclusion	0.855	0.856	0.902	Reliable
Financial Literacy	0.814	0.827	0.877	Reliable
Financial Behavior	0.850	0.877	0.899	Reliable
Financial Risk	0.890	0.893	0.924	Reliable

Source: Authors (2024)

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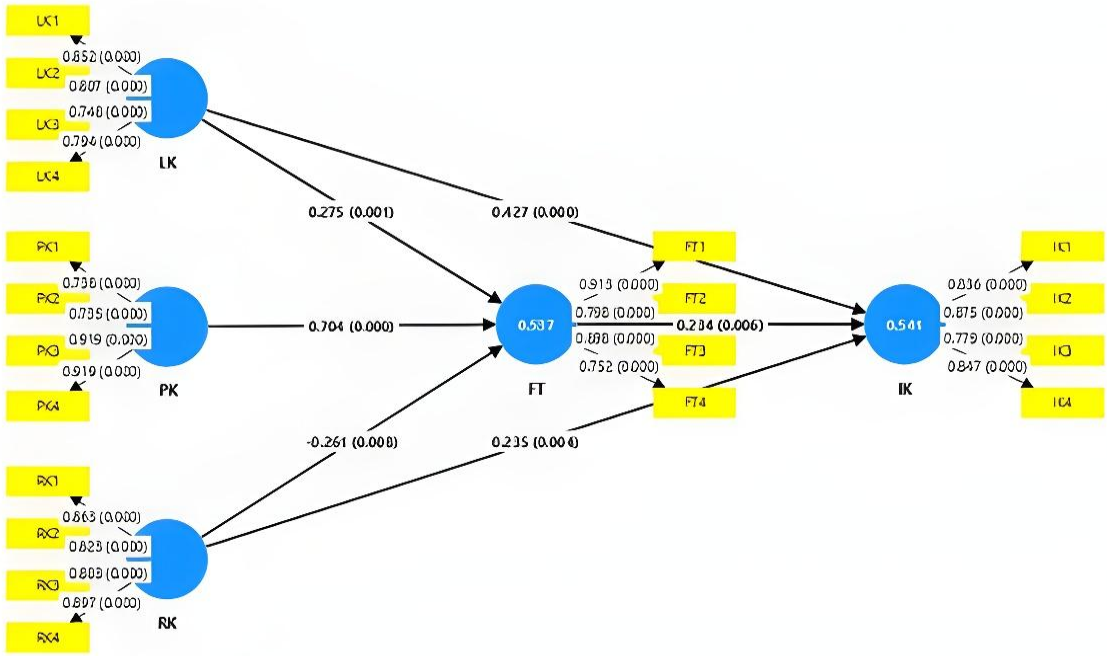

Figure 1. Full Model

The structural model, or inner model, is used to predict causal relationships among latent variables. It represents the relationships between constructs as developed based on substantive theory. The evaluation of the structural model can be conducted through several tests. The evaluation of the structural model in PLS commences with the analysis of the R-square (R^2) value for each endogenous latent variable, reflecting the predictive capacity of the structural model. The R^2 value denotes the fraction of variation in the construct elucidated by the model. As per the guideline, R^2 values of 0.75, 0.50, and 0.25 signify substantial, moderate, and weak predictive accuracy, respectively (Ghozali, 2021).

Table 7. R-Square

Variable	R-square	R-Square
Financial technology	0.537	0.523
Financial Inclusion	0.541	0.527

Table 8. T-test

Direction	Original Sample (O)	T Statistic	P-Values
Financial Technology → Financial Inclusion	0.234	2.522	0.006
Financial Literacy → Financial Technology	0.275	3.271	0.001
Financial Literacy →Financial Inclusion	0.427	5.140	0.000
Financial Behavior → Financial Technology	0.704	7.373	0.000
Financial Risk → Financial Technology	-0.261	2.396	0.008**
Financial Risk → Financial Inclusion	0.235	2.653	0.004

According to Table 7, the Adjusted R-Square value for the Financial Technology variable is 0.523, signifying that 52.3% of the variance in this variable is elucidated by

other exogenous latent variables, and the remaining 47.7% is ascribed to factors not incorporated in the model. The Financial Inclusion variable exhibits an Adjusted R-Square value of 0.527, indicating that 52.7% of its variance is attributable to exogenous latent variables, while the remaining 47.3% is accounted for by other external factors. Consequently, it can be inferred that the R-Square values for both Financial Technology and Financial Inclusion signify a reasonable degree of predictive accuracy.

Statistical significance (p-value) was employed in hypothesis testing. A p-value below 0.05 signifies statistical significance, while a p-value above 0.05 shows a lack of significance. Applying the degrees of freedom formula df = n – 2 and n = 100, the degrees of freedom in this study are 98. The crucial t-value, according to the t-distribution table, is 1.96. The objective of hypothesis testing is to evaluate the significance of the relationship between exogenous and endogenous variables. In SEM-PLS analysis, this is conducted via the bootstrapping technique and path coefficient assessment, with significant criteria of a p-value < 0.05 and a t-statistic > 1.64.

This study's findings demonstrate that Financial Technology (FinTech) positively and significantly influences financial inclusion, evidenced by a direct impact value of 0.234, a T-statistic of 2.522 (exceeding the 1.96 threshold), and a p-value of 0.006 (below 0.05), confirming statistical significance. A one-unit rise in FinTech adoption results in a 23.4% enhancement in financial inclusion. The findings correspond with previous studies and theoretical frameworks, including those by (Durai et al. 2019), (Holle, 2019), and (Yanti, 2019), which highlight that FinTech enhances affordable access to formal financial services—particularly for marginalized and vulnerable populations—via digital solutions for credit, savings, transactions, and insurance. FinTech improves SMEs' access to financial services independent of traditional banks, hence fostering their sustainability and growth. Moreover, the results are corroborated by Financial Resilience Theory (Salter et al. 2018). Our findings suggest that fintech operates as a polycentric, inclusion-enhancing infrastructure that strengthens SMEs' capacity to absorb, adapt to, and transform in response to financial shocks. Mechanistically, digital payments and e-wallets reduce transaction costs and cash-flow volatility; alternative-data credit scoring (e.g., sales, platform ratings) broadens credit access beyond collateral-based lending; P2P lending and crowdfunding diversify funding sources; and micro-insurance products hedge idiosyncratic risks. These channels collectively expand the availability, affordability, and timeliness of formal financial services, thereby improving day-to-day liquidity management and investment readiness, key markers of resilience. These findings align with (Mauliddah, 2024), who similarly identified a positive association between fintech use and financial inclusion, indicating that digital rails are not merely substitutes for legacy finance but catalysts that unlock new participation margins for underserved firms. Importantly, the resilience dividend from fintech is higher when complemented by consumer protection, data-privacy safeguards, interoperable payment rails, and targeted literacy programs that mitigate perceived risk—conditions that our model also flags as critical, given risk's dampening effect on fintech adoption. In short, fintech is pivotal not only for widening access but for embedding flexibility and redundancy into SME financial ecosystems, translating inclusion into durable financial resilience.

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A direct influence value of 0.275, a T-statistic of 3.271 (higher than 1.96), and a p-value of 0.001 (below 0.05) all support the study's findings that financial literacy has a positive and significant impact on the adoption of financial technology. This research indicates that elevated financial literacy enhances the probability that individuals and SME participants will effectively access and employ fintech services. Financial literacy provides individuals with the information and skills necessary to comprehend and navigate digital financial services, make educated financial choices, and reduce risk, thereby promoting financial inclusion and resilience. Our results deepen the claims of (Durai et al. 2019) and (Holle, 2019), by showing not only that financial literacy enables vulnerable and low-income groups to use affordable services (microloans, digital payments, investment apps), but also how it does so through three reinforcing channels relevant to SMEs. First, literacy improves informational capability—owners can compare costs, evaluate credit terms, and detect predatory features, which raises effective demand for formal products and reduces reliance on informal lenders. Second, it strengthens financial operations—better budgeting, recordkeeping, and cash-flow forecasting translate into timelier repayments and stronger digital transaction trails, which in turn improve alternative-data credit scores and loan eligibility on fintech platforms. Third, literacy enhances risk management—firms learn to diversify funding, maintain liquidity buffers, and adopt micro-insurance, lowering volatility and default risk. Within Financial Resilience Theory, these channels build adaptive capacity (faster recovery from shocks), institutional embeddedness (more stable ties with banks, cooperatives, and fintechs), and strategic agility (greater readiness to invest and formalize). In our setting, higher literacy thus amplifies the payoffs from fintech adoption while dampening the deterrent effects of perceived risk, converting mere access into sustained, resilient financial inclusion for SMEs. (Ainiyah et al. 2022) further corroborate this by identifying a substantial positive correlation between financial literacy and the utilization of fintech. Financial literacy is a crucial facilitator for the successful use of financial technology, promoting financial inclusion and enhancing the economic resilience of SMEs.

According to the results of this investigation, financial literacy has a statistically significant and positive impact on financial inclusion, as evidenced by a direct influence value of 0.427, a T-statistic of 5.140, and a p-value of 0.000. A one-unit increase in financial literacy results in a 42.7% enhancement in financial inclusion. These findings correspond with the financial inclusion hypothesis posited by (Durai et al. 2019), which underscores the necessity of accessible and cheap financial services for marginalized and low-income populations. Enhanced financial literacy empowers individuals and SMEs to comprehend and leverage diverse financial instruments, including savings, credit, and insurance, thus augmenting their engagement in the formal financial system. (Holle, 2019) emphasizes that financial literacy enables individuals to make informed and responsible choices concerning advantageous and cost-effective financial products. This study, supported by findings from (Ainiyah et al. 2022), emphasizes the essential importance of financial literacy in facilitating access to financial services, raising financial well-being, and promoting financial inclusion. Consequently, enhancing financial literacy needs to be a primary strategic focus for advancing equitable financial systems.

The findings of this investigation demonstrate that financial behavior has a positive and significant impact on the adoption of financial technology. The direct effect value is 0.704, the T-statistic is 7.373, and the p-value is 0.000, all of which suggest a high level of statistical significance. This indicates that persons exhibiting superior financial behavior, characterized by proficient money management and judicious use of financial products, are more inclined to embrace and employ fintech services, including digital wallets, investment applications, online loans, and insurance. These findings correspond with the notion of financial inclusion as articulated by (Durai et al. 2019) and (Holle, 2019), highlighting that enhanced financial behavior promotes access to advantageous and inexpensive financial services, particularly for marginalized and low-income populations. Moreover, according to Financial Resilience Theory, constructive financial conduct underpins economic resilience, allowing individuals and SMEs to more effectively endure financial shocks and uncertainties via the strategic utilization of fintech instruments. By cultivating robust financial practices—such as cash flow management, long-term strategizing, and digital financial literacy—individuals are more adept at adapting, accessing emergency resources, and sustaining stability amid crises. The findings align with (Dewi, 2020), underscoring the necessity for enhanced financial behavior, especially among SMEs and marginalized groups, to optimize the efficacy of fintech in advancing financial inclusion and resilience. Enhancing financial literacy and broadening access to fintech platforms can further facilitate this shift.

According to the results of this investigation, the adoption of financial technology is statistically significant and negatively influenced by financial risk, with a direct coefficient of -0.267, a T-statistic of 2.396, and a p-value of 0.008. This signifies that a one-unit rise in financial risk results in a 26.7% decline in the adoption of fintech. The substantial negative trend contradicts the stated theory, leading to its rejection. The findings indicate that elevated financial risk, whether perceived or real, discourages individuals—particularly from vulnerable or low-income demographics—from embracing fintech solutions, as they may link these technologies with uncertainty or potential loss. This corresponds with the perspectives of (Durai et al. 2019) and (Holle, 2019), who contend that financial inclusion necessitates not just accessibility but also confidence and perceived security in financial services. According to Financial Resilience Theory, increased financial risk may hinder users' ability to properly utilize fintech, hence diminishing resilience instead of strengthening it. Consequently, alleviating both perceived and actual financial risks via enhanced platform reliability, customized financial solutions, and user education could be crucial for increasing fintech adoption. These results align with those of (Marisa, 2020), who similarly indicated a negative correlation between financial risk and the utilization of financial technology.

The research determined that financial risk has a significant and positive impact on financial inclusion, with a direct effect coefficient of 0.235, a T-statistic of 2.653, and a p-value of 0.004. This indicates that a one-unit rise in financial risk correlates with a 23.5% enhancement in financial inclusion, corroborating the established premise. Consistent with the paradigm of financial inclusion (Durai et al. 2019); (Holle, 2019), the results demonstrate that effectively managed financial risk can improve access to formal financial services, especially for marginalized and low-income groups. Financial products, like

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insurance, savings, and microloans, intended to alleviate economic uncertainty, can promote engagement in the formal financial system. This is additionally corroborated by Financial Resilience, which underscores institutional governance and individual capability to navigate financial disruptions. When individuals or SMEs comprehend and mitigate financial risk proficiently, they are more inclined to utilize formal financial items, including fintech solutions, that enhance resilience and economic security. Consequently, enhanced risk management not only fosters financial inclusion but also fortifies financial resilience among communities. These results align with the findings of (Yunus et al., 2022), who similarly identified a positive and substantial correlation between financial risk and financial inclusion. The study emphasizes the necessity of providing risk-reducing financial products such as microinsurance and accessible credit, while improving financial literacy to foster wider, inclusive financial engagement.

5. Conclusions, Implications, and Limitations

This research provides empirical evidence that financial technology (fintech) exerts a substantial, beneficial effect on financial inclusion among small, and medium-sized enterprises (SMEs), with the relationship conditioned by financial literacy, financial behavior, and financial risk; financial literacy deepens understanding of fintech's benefits and hazards, financial behavior reflects disciplined resource management that accelerates adoption, while elevated perceived risk suppresses uptake and lower risk fosters trust. These findings indicate that all three drivers act directly on inclusion, literacy expands informed access to formal services, prudent behavior improves quality of use, and effective risk management builds confidence in the formal system, positioning fintech as a catalyst that broadens access and strengthens SMEs' financial resilience.

Theoretically, the findings reinforce models of technology adoption that emphasize cognitive capacity, behavioral discipline, and risk assessment as foundational determinants of digital financial engagement. Practically, they indicate that SMEs benefit most from fintech when owners possess adequate literacy to evaluate benefits and drawbacks, maintain sound financial habits, and perceive risks as manageable. From a policy perspective, the results highlight the importance of integrated interventions—such as targeted literacy programs, behavior-oriented financial management training, and strengthened consumer protection—to build trust and expand meaningful use of financial technologies. Collectively, the findings position fintech not only as an enabler of broader access to formal finance but also as a driver of stronger financial resilience among SMEs.

This study's limitations stem from its cross-sectional design, reliance on self-reported data, and the focus on a specific type of SME—primarily locally oriented MSMEs whose financial needs, market exposure, and technological readiness may differ from export-oriented or digitally intensive firms. Consequently, the dynamics of fintech adoption observed here may not fully generalize to SMEs with broader market linkages, more complex financing structures, or higher exposure to international regulatory and transaction risks. Future research should compare different types of SMEs (e.g., local vs. export-oriented, traditional vs. digitally native sectors) to reveal how market orientation shapes fintech needs, adoption triggers, and risk perceptions. Longitudinal designs, objective transaction data, and mixed methods would further strengthen causal insights and

clarify the mechanisms through which literacy, behavior, and risk translate into sustained fintech use and durable financial inclusion.

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