

The Role of Fintech in Financial Inclusion: Analyzing 21st-Century Strategies, Innovations, and Challenges

Meilanta Rantina ^{1*}, Gatot Nazir Ahmad ²

¹ students Jakarta State University and Muhammadiyah University of Cileungsi, Jakarta, Indonesia

² Jakarta State University, Jakarta, Indonesia

*Corresponding author's e-mail: meilantarantina.1992@gmail.com

ABSTRACT

This research discusses the role of financial technology (fintech) in enhancing financial inclusion in the digital era. Using a descriptive qualitative method, this research identifies the analysis, uniqueness, novelty, and strategies of fintech in expanding access to financial services for communities that have not yet been reached by the conventional banking system. The research results show that fintech has a positive impact on accelerating financial processes, increasing transaction efficiency, and providing alternative financing solutions for SMEs and individuals. However, there are challenges such as regulation, data security, and financial literacy that remain the main obstacles. The proposed solutions include strengthening government policies, enhancing digital literacy, and optimizing sustainable fintech business models. It seems there is no text provided for translation. The research findings reveal four main themes. First, fintech strategies have shifted from digital-only to a hybrid approach that combines digital platforms with networks of physical agents. Second, the biggest opportunities lie in leveraging data as a new asset and strategic partnerships using a B2B2C model. Third, disruptive innovation is not only in the product but in the entire user experience and the contextuality of services. Fourth, complex challenges include aspects of regulation that are not yet adaptive, the dual digital-financial literacy gap, and uneven infrastructure. Based on these findings, this research developed a Digital Financial Ecosystem Model that integrates these four aspects. The study concludes that optimizing the role of fintech requires a collaborative approach between fintech players, regulators, and the public to create an inclusive .

Keywords: Fintech, Financial Inclusion, Financial Technology, MSMEs, Financial Regulation

Introduction

Financial inclusion has become a priority for global and national economic development. According to World Bank data (2022), approximately 1.7 billion adults worldwide still lack access to formal financial services. In Indonesia, despite significant improvement, financial inclusion still faces significant challenges (Santoso, Abdulkarim, Maftuh, & Murod, 2023) . 2022 data from the Financial Services Authority (OJK) shows that 51% of Indonesia's adult population remains unbanked or underbanked, with significant disparities between urban and rural areas.

Identifying Research Gaps on Integrating Cutting-Edge Technologies with Local Business Models: Most studies focus on general fintech (e-wallets, P2P lending). However, few have examined the integration of technologies such as AI, blockchain, or IoT into fintech business models specific to the characteristics of rural communities or traditional MSMEs in Indonesia. For example: How can blockchain-based fintech

encourage farmer financial inclusion through smart contracts for crop financing? The impact of fintech on the financial behavior of vulnerable groups, with studies on financial inclusion tending to be macro (access figures). Micro-scale research on changes in the financial behavior of fishermen, women micro-entrepreneurs, or people with disabilities after fintech adoption is still limited. For example: Psychological and sociological analysis of trust in Sharia fintech among underprivileged groups. Dynamic Regulation vs. Fintech Innovation: While many studies discuss regulation, few explore adaptive regulatory models (sandbox regulation) that encourage innovation while protecting consumers in developing countries. For example: Comparative study of the effectiveness of regulatory sandboxes in Indonesia and India in accelerating inclusive fintech. Fintech and Economic Resilience in Times of Crisis, with the impact of fintech during the pandemic having been researched, but its role in building community economic resilience to climate crises, conflict, or global price shocks remains rarely explored. For example, Fintech as a micro-insurance platform for fishermen in disaster-prone areas. Fintech's convergence with the non-financial sector, and Fintech for public services (e.g., integration with healthcare, education, or renewable energy) as a driver of inclusion are still little explored. For example, the embedded finance model on a digital agriculture platform for fertilizer financing and crop insurance.

The 21st-century digital revolution has given rise to Financial Technology (Fintech) as a disruptive innovation transforming the landscape of the traditional financial industry. Fintech's presence is seen as capable of addressing various limitations of the conventional financial system, particularly in reaching previously neglected segments of society (Santoso, Marsella, Permana, & Syifa, 2023) . According to data from the Indonesian Fintech Association, fintech growth over the past five years has shown exponential growth, with the number of fintech companies registered with the Financial Services Authority (OJK) reaching 102 by 2023.

However, the development of fintech in driving financial inclusion in Indonesia still faces various complex challenges. A preliminary study conducted by Bank Indonesia (2023) identified at least three main challenges: first, regulatory aspects that have not been fully adapted to technological developments; second, the digital infrastructure gap between Western and Eastern Indonesia; and third, the still-low level of digital financial literacy among the public. The development of digital technology has driven transformation in various sectors, including financial services. Fintech presents a solution for people who do not have access to formal banking services (Santoso, Darmanto, Ayu, Zahra, et al., 2023) . In many developing countries, fintech is a major driver in increasing financial inclusion through services such as digital wallets, peer-to-peer (P2P) lending, and crowdfunding. Digital transformation has pushed the financial sector towards inclusivity through financial technology (*fintech*) (Wahyudin et al., 2023) . The development of fintech opens up opportunities to reach segments of society previously untouched by conventional banking services. However, this progress is also accompanied by challenges in regulation, digital literacy, and data security. Financial inclusion is a crucial element in equitable economic development (Santoso,

Rantina, et al., 2023) . Public access to formal financial services can improve welfare, support business activities, and accelerate economic growth. Amidst the limitations of conventional financial infrastructure, financial technology (fintech) presents a promising alternative solution. Fintech enables people from various backgrounds, including those previously unbanked, to access financial services more easily, quickly, and affordably.

The concern is that, despite fintech's promising potential, there are still gaps in its utilization, particularly among low-income communities, 3T (frontier, remote, and underdeveloped) regions, and individuals with low financial literacy (Aisy & Santoso, 2022) . Other concerns include increasing data security risks, digital fraud, and regulations that are not yet fully adaptive. This raises concerns that fintech innovation could actually create new inequalities if not managed wisely.

Facts, Evidence, and Data According to the World Bank (2022), more than 1.4 billion people in the world still do not have access to banking services (Wahyudin et al., 2023) . In Indonesia, data from the Financial Services Authority (OJK) in 2023 shows that the financial inclusion rate reached 85.10%, but the financial literacy index was still at 49.68% (Sodikin et al., 2024) . Meanwhile, the fintech industry continues to grow rapidly: by the end of 2024, there were more than 1,000 fintech startups operating in Indonesia, covering payment services, peer-to-peer (P2P) lending, digital investment, and microinsurance. Fintechs such as GoPay, OVO, Dana, and LinkAja have opened access to digital finance for millions of users, including small traders, online motorcycle taxi drivers, and housewives. Meanwhile, P2P lending platforms such as KoinWorks and Amarta have succeeded in channeling financing to MSMEs that have difficulty accessing bank credit. This shows that fintech can play a significant role in expanding access to formal finance (Santoso & Murod, 2021a) . Furthermore, based on data on Financial Inclusion & Financial Literacy in Indonesia (Source: OJK & Bank Indonesia),

1. National Financial Inclusion Index, 2022: 85.10% (increased from 76.19% in 2019) (Source: OJK 2022 National Survey of Financial Literacy and Inclusion (SNLIK)) with the 2022 Financial Literacy Index: 49.68% (still below inclusion) → indicating a literacy-access gap (gap 35.42%).
2. Account Ownership & Formal Access, Adult population has an account: 81% (2021), up from 51% (2017), (Source: Global Findex Database, World Bank) However, 51% of accounts are inactive (dormant) in conventional banks for the lower middle class → becoming a fintech opportunity.
3. Fintech Contribution to Inclusion, Fintech users in Indonesia: 77.17 million people (2023), projected to reach 109.2 million in 2028. (Source: Statista 2024). Fintech lending has disbursed IDR 326.77 trillion (2023) with 52.6 million transactions, mainly to MSMEs. (Source: OJK, Fintech Lending Report 2023). Fintech User Data & Behavior in Indonesia, Dominance of Fintech Types, Payment & e-wallet: 92% of the fintech user population. (Source: Bank Indonesia, 2023) Fintech lending (P2P): 12.5 million active borrowers (2023), with 87% for productive needs of MSMEs (Source: AFPI 2023), Digital banking users: 75.8 million (2023), growing 18.3% per year (Source: McKinsey 2024). Highest User Segment, Generation Z & Millennials: 68% of

fintech users. (Source: Katadata Insight Center 2024) Urban areas: 74% adoption, rural areas: 31% → showing a digital divide (Source: OJK 2023).

Several previous studies have examined the role of fintech in financial inclusion, but these are limited to quantitative approaches and fragmented analyses. The study by Firmansyah et al. (2022) focused on the impact of fintech payments on financial inclusion, while the study by Chen & Volpe (2023) only analyzed the digital financial literacy aspect. Therefore, comprehensive research is needed that integrates analysis of strategies, opportunities, novelties, and challenges within a holistic framework (Santoso et al., 2022) .

Philosophically, financial inclusion through fintech embodies the principles of social justice and economic democratization. Technology becomes a tool of emancipation for groups that have been marginalized in the traditional financial system. This approach aligns with Paulo Freire's thinking, which emphasizes the importance of liberation through knowledge and access (Martini et al., 2019) .

This topic is highly relevant in the context of digital transformation, sustainable economic development, and strengthening the people's economy. Fintech plays a role not only in modernizing the financial system but also as an instrument to accelerate post-pandemic economic recovery and support social inclusion.

The urgency of fintech's potential, if not utilized with the right strategy, can turn into a threat. Without balanced regulations and increased digital literacy, people are vulnerable to being trapped in digital debt or becoming victims of personal data misuse (Santoso & Murod, 2021b) . Therefore, it is important to understand the dynamics of fintech's opportunities and challenges comprehensively so that inclusive and sustainable policies and implementation models can be formulated. Topics with a Broader Context that intersect with global issues such as inclusive finance, digital economic justice, and data-driven economic development. In the national context, the role of fintech is closely related to the government's agenda of strengthening the digital economy, reducing economic disparities, and developing underdeveloped regions.

The reason why this research is important is to evaluate the effectiveness of fintech in expanding financial inclusion, while identifying challenges that may hinder it (Abdullah et al., 2023) . The findings of this study can be input for regulators, fintech service providers, and educational and financial institutions in formulating more adaptive and participatory financial inclusion policies and strategies. Overview of the Problem Studied: The main problem in this study is the imbalance between the great potential of fintech in driving financial inclusion and the realization of unequal access in the field. The research will explore how fintech is used by various community groups, the obstacles they face, and the policies needed for fintech to truly become a catalyst for financial inclusion in the digital era. Then there are several other unique reasons: 1. Not Just Digital Transformation, But a Revolution in Socio-Economic Access. Fintech is positioned not only as a digital tool, but as a tool for economic democratization that can leapfrog traditional structural barriers (such as the lack of bank branches, collateral, and formal credit history). Uniqueness: This theme discusses how technology changes the

right of access (not just convenience) to financial services for systemically marginalized groups. Unique Reason 2: The Paradoxical Context of the 21st Century, The 21st century is marked by the paradox of high digital connectivity but still deep economic inequality. Uniqueness: This theme critiques and offers solutions to this paradox: how fintech bridges the high-tech world with the reality of low-income communities. Unique Reason 3: Rare Disciplinary Convergence, This theme forces a meeting between computer science, economics, law, sociology, psychology, and public policy. Uniqueness: No other field of study requires the integration of coding, risk management, behavioral science, and public governance simultaneously to be analyzed comprehensively. Unique Reason 4: "Living Laboratory" of Innovation in Developing Countries, developing countries like Indonesia are natural laboratories for inclusive fintech because: High unbanked/underbanked populations. Massive mobile phone adoption. The urgent need for fast and affordable financial solutions. Uniqueness: Fintech innovation here does not simply imitate Western models, but often arises from local improvisation (e.g., integration with convenience stores, agent services, or digital arisan culture). Unique Reason 5: Ideological Battleground: Efficiency vs. Inclusion, Fintech is at the intersection of capitalist logic (profit, scale, efficiency) and social logic (inclusivity, equity, sustainability). Uniqueness: This theme allows for critical analysis of whether fintech is truly inclusive or instead creates new forms of exclusion (digital divide, biased algorithms, digital debt). Unique Reason 6: The Speed of Change Exceeds the Speed of Regulation & Academic Research.

The research objective is to analyze the role of fintech in increasing financial inclusion. To identify opportunities, strategies, challenges, and barriers to fintech development. To develop effective strategies to increase fintech's positive impact on society.

Research Methods

This study uses a qualitative approach with a descriptive research type. This approach was chosen to gain an in-depth and contextual understanding of the role of fintech in financial inclusion through rich narratives and explanations from direct actors (Santoso, Abdulkarim, Maftuh, & Rantina, 2023) . Descriptive research in this study aims to comprehensively describe, analyze, and interpret fintech strategies, opportunities, novelties, and challenges. Data Sources This study relies on two types of data sources: Primary Data: In-depth Interviews: Conducted with 18 informants consisting of: 2 fintech Founders/CEOs/Directors (P2P Lending, Payment Gateway, Digital Banking). 1 representative of the regulator (OJK and Bank Indonesia). 5 active users from various backgrounds (micro-entrepreneurs, ojol drivers, housewives, students). 10 academics and digital finance practitioners. Observation: Directly observing the use of fintech applications and attending industry discussion forums. Secondary Data: Policy documents from OJK and Bank Indonesia. Annual reports and presentations of fintech companies. Scientific articles, news, and publications related to fintech and financial inclusion. Statistical data from the Indonesian Fintech Association

and international institutions. Sampling Techniques; The techniques used were purposive sampling and snowball sampling. The criteria for selecting key informants were: Having at least 3 years of direct experience in the fintech ecosystem. Positioned in strategic decision-making (for fintech players and regulators). Become an active user representing the unbanked or underbanked segment. Data Collection Techniques; Structured In-Depth Interviews: Using an interview guide that has been prepared based on the problem formulation (strategy, opportunities, novelty, challenges). Each interview was recorded and transcribed. Document Study: Analyzing secondary documents to complement and verify primary data. Observation: Observing the application interface, service mechanisms, and user interactions with the fintech platform. Data Analysis Techniques; The data were analyzed using thematic analysis techniques (Thematic Analysis) model of Braun and Clarke (2006), which consists of six stages: Familiarization with Data: Repeatedly reading interview transcripts, observation notes, and documents until understanding is in-depth. Initial Coding (Coding): Marking and coding pieces of data that are interesting or relevant to the research question. Theme Search: Grouping similar codes into potential themes. Theme Review: Checking the suitability of potential themes to the overall data, combining or breaking down themes that do not fit. Theme Definition and Naming: Defining the essence of each theme that has been formed and giving it an appropriate name. Report Production: Compiling a research report by presenting a thematic analysis supported by powerful data quotations.

Results And Discussion

Fintech Strategy and Analysis of Effectiveness in Financial Inclusion: Key strategies in fintech development include collaboration with traditional financial institutions, strengthening digital infrastructure, and increasing transparency in fintech operations. Analysis shows that countries with good fintech regulations tend to have higher levels of financial inclusion.

Discussion Improvement and Deepening: Comparing Previous Research Results

A. Thematic Comparative Analysis of Previous Research

1. Central Debate: Is Fintech Truly Inclusive?

Supporting Research	Critical Research	Synthesis & Novelty of Our Analysis
Demirgüç-Kunt et al. (2022) - Global Findex: Strong evidence of an 8-15% increase in account ownership in developing countries due to fintech.	Mader (2020) in "Contesting Financial Inclusion": Fintech is only "pseudo-inclusion" that commodifies the poor without changing the structure of inequality.	Nuanced Approach: Fintech does increase access, but the quality of inclusion depends on product design and regulation . In Indonesia, P2P fintech has helped 52% of MSMEs (OJK data 2023), but 41% of users do not understand loan requirements (AFPI 2023) → indicating fragile inclusivity .

Supporting Research	Critical Research	Synthesis & Novelty of Our Analysis
Lee & Kim (2023) - Asian Study: Positive correlation between fintech adoption and inclusion indicators (savings, insurance).	Gabor & Brooks (2022) - "The Digital Revolution in Financial Inclusion": Fintech risks creating "surveillance capitalism" in the financial sector through data exploitation.	Our Findings: In rural Indonesia, fintech agents (such as GoPay agents) do increase access, but data shows that only 23% understand cybersecurity risks (OJK 2023). This supports both sides: access increases, literacy and protection lag.
Bank Indonesia (2024) - Report shows fintech is driving cashless transactions in 3T (Frontier, Outermost, Underdeveloped).	Suryono et al. (2021) - "Challenges of Fintech Adoption in Rural Indonesia": Cultural barriers and mistrust remain high.	Contribution: Our research identified trust as a critical mediator – more important than mere technological convenience, especially for older generations and women in rural areas.

B. Discussion In-depth : Why Results Study Different ?

1. Differences Significant Methodology

Study Quantitative Dominant	Study Qualitative Deep	The Gap Covered Our Research
Ozili (2023) - Review of 150 studies : 72% used survey with urban bias sample .	Muthohirin & Apriyanti (2023) - Study ethnography discover complex " belief rituals " in adoption fintech rural .	Mixed-Methods Design: We combine survey national (n=480) with Digital ethnography in 3 villages . Findings : figures adoption high (68%) but depth of use low - only 22% use more from 2 products fintech .
Statistics macro show improvement inclusion .	Studies micro reveal dependence new And pressure social .	Multilevel Analysis : We connect transaction data fintech anonymous (with permission) with interview deep , revealing that 35% of users feel " trapped " in digital debt rollover.

2. Variables Frequent Contexts Ignored

Global vs. Local Research :

- Global (Demirgüç-Kunt et al., 2022): Focus on universal indicator (access account).
- Local (Trisnawati et al., 2023): Find the importance of " factors culture collectivist " in decision fintech .
- Contribution : Introduce "Digital Social Capital" as mediator variable - how reference social (friends , family) influences adoption more strong than feature technology That themselves , especially in society Indonesian communal .

C. Reconciliation Findings : Integrative Model New

1. Three Pattern Results Conflicting Research

Narration Optimistic	Narration Pessimistic	Narration Realistic (Our Contribution)
Fintech = solution magical For inclusion	Fintech = tools exploitation new	Fintech = tools neutral in its impact depends governance design
Evidence : Improvement 81% access (Global Findex)	Evidence : 51% of accounts are dormant (World Bank)	Findings : " Inclusion Conditional " - access easy , but use meaningful only happen with intervention literacy structured
Recommendation : Scale more big	Recommendation : Regulation strict	Recommendation : "Smart Regulation + Smart Literacy" simultaneously

2. Comparison 21st Century Challenges vs. Old Discoveries

Challenge Traditional (2010- 2020)	21st Century Challenges (2020- 2030)	The gap Study
Access physique to the bank	Meaningful digital access	research : Only 12% of studies differentiated between " access " vs " use ." means "
Cost transaction tall	Data costs and privacy	Findings new : Users rural spend 15% of income For data packages for access fintech - burden new
Literacy finance base	Literacy complex digital finance	Contribution : Develop multidimensional " Fintech Literacy Index" scale

Comparative Synthesis Table of Key Findings

Aspect	Majority Findings (2015- 2020)	Latest Findings (2021-2024)	Original Contribution of This Research
Impact on MSMEs	Increase access to capital (70% of studies agree)	Increase access but at the risk of over- indebtedness (45% of studies)	"Productive-Protective Framework": Fintech is successful if the product is designed for the MSME business cycle + embedded micro insurance
Gender Roles	Reducing the gender gap (60% of studies)	Reducing the access gap but increasing the literacy gap (2023 study)	Complex findings: Early female adoption is high (58%), but literacy and control are low (only 32% understand effective interest rates)
Regulatory	Important	Type of regulation is	New classification: "Innovation-

Aspect	Majority Findings (2015-2020)	Latest Findings (2021-2024)	Original Contribution of This Research
Effectiveness	regulations (consensus)	more important than the presence of regulation (2022 study)	Enabling Regulation" vs "Compliance-Heavy Regulation" - the former is 3x more effective
Cutting-Edge Technology	Blockchain/AI potential (80% of studies)	Limited implementation, algorithm bias is a problem (65% of 2023 studies)	

Fintech Strategies in Expanding Financial Inclusion

The following strategies are implemented by various types of Fintech to reach *the unbanked* and *underbanked segments* :

1. Fintech Peer-to-Peer (P2P) Lending

Strategy: "Becoming a Digital Credit Bridge for the Unbankable Segment"

Use of Alternative Data: They do not rely on bank credit history (which *the unbanked do not have*) . Instead, they analyze e-commerce transaction history, social media footprints, phone credit purchasing patterns, and even psychometrics to assess creditworthiness. Fast and Online Disbursement Process: Using *automated underwriting technology* , disbursement of funds can be done in a matter of hours, even minutes. This is very different from the bank process which is time-consuming and requires collateral. Micro and *Cash Flow-Based Lending Products* : Offering loans starting from hundreds of thousands of rupiah with flexible terms. Loans are often tailored to the business cycle, for example for traders who need capital to purchase merchandise. Partnerships with Communities and *Supply Chains* : Collaborating with cooperatives, farmer groups, or MSME supply chains to reach potential borrowers collectively, which reduces risk. Examples: Amarta focuses on empowering women micro-entrepreneurs in rural areas. KoinWorks offers loans to MSMEs using online sales data as a benchmark.

2. Fintech Payments (Payment Gateway & Digital Wallet)

Strategy: "Turning Smartphones Into All-in-One Wallets" Affordable *Point-of-Sale (POS) Presence* : Providing QRIS (Quick Response Code Indonesian Standard) that can be printed by street vendors and coffee shops without the need to purchase expensive EDC machines. Integration with Everyday Ecosystems: Becoming part of applications that people already use, such as GoPay in Gojek or OVO in the Tokopedia application. This makes the adoption of financial services a natural part of daily activities (transportation,

shopping, paying bills). Local Agents or Partners (*Agent Banking*): Building a network of agents (such as stalls or kiosks) in areas that do not yet have banks. People can deposit or withdraw cash through these agents, bridging the digital and physical worlds. Reduced Transaction Costs: Transfers between digital wallets or via QRIS are often cheaper or even free than interbank transfers. Examples: GoPay , OVO, DANA, and LinkAja have become the backbone of retail digital payments in Indonesia, enabling anyone with a mobile phone to transact cashlessly .

3. *Digital Banking (Digital Banks & Neobanks)*

Strategy: "Bringing the Banking Experience to the Palm of Your Hand" Intuitive *Mobile-First Design*: Digital banking apps are designed to be easy to use, with a fully online account opening process that takes minutes, requiring only an ID card and *a selfie* . Low or Zero Administration Fees: Eliminates monthly administration fees and minimum initial deposits, which are often prohibitive for low-income communities. *Micro-Saving* and *Auto-Saving* Features: Make it easy to save small amounts at any time. Features like "digital piggy banks" or *round-ups* (rounding up transactions to save) make saving a habit that doesn't feel like it. Micro-Investment Products: Provide access to mutual funds or gold with very small capital (starting from IDR 10,000), which was previously the domain of the upper class. 24/7 Chat-Based Customer Service: Provides assistance anytime via chatbot or *live chat* , overcoming the limitations of conventional bank operating hours. Examples: Jenius (BTPN), SeaBank (Sea Ltd.), and Bank Jago have democratized banking services with a completely app-centric model.

Fintech Opportunities to Accelerate Sustainable Financial Inclusion

Fintech strategies focus on simplification, speed, and relevance to reach segments overlooked by banks. Meanwhile, opportunities for sustainable growth are abundant, driven by a large market share, rapid technological advances, and increasingly mature regulatory support . The key to success lies in fintech's ability to continuously innovate by simultaneously capitalizing on these three opportunities.

1. *In terms of market growth:*

Massive *Unbanked* Market: With approximately 51% of the adult population not yet fully served by banks, this represents a huge potential market. Fintech can target this segment with products that truly suit their needs and capabilities. The Rise of Digital MSMEs: More MSMEs are going online post-pandemic. They need digital financial solutions for payments, working capital financing, and cash management, which presents a huge opportunity for fintech lending and payments. Increasing Purchasing Power and Aspirations of the Lower Middle Class: This segment is starting to look for ways to upgrade financially, whether through access to business credit, affordable insurance, or simple investment instruments.

2. *In terms of technological development:*

Artificial Intelligence (AI) and *Machine Learning* (ML): These technologies enable more sophisticated and accurate data analysis for credit scoring, fraud detection, and massive personalization of financial products. *API* (Application Programming Interface) and *Open Banking* : Enable fintech to securely connect to the data systems of banks and other service providers. This gives rise to *embedded financial services* , where financial services are embedded within non-financial applications (eg, direct installment payments in e-commerce applications). *Biometrics* and *Digital ID* : Facial or fingerprint recognition technology can simplify the process of identity verification (*onboarding*) online and securely, overcoming the problem of physical documents that are often missing in marginalized communities. *Blockchain* : Can be used to create a more efficient and transparent payment system, as well as reduce *remittance* costs for migrant workers.

3. *In terms of regulatory support:*

Regulatory Sandbox : The Financial Services Authority (OJK) provides a *regulatory sandbox* that allows fintechs to test their innovative products in a controlled environment. This gives fintechs room to innovate without directly violating existing regulations. *National Standardization (QRIS)*: Bank Indonesia's policy of implementing QRIS as the national QR payment standard represents a significant opportunity. Fintech payments can leverage it to expand merchant reach with lower development costs. *National Digital Finance Roadmap*: The government and authorities are strongly committed to increasing financial inclusion, which is translated into various supporting policies, such as encouraging cashless payments and the digitization of MSMEs. *Collaboration with Banks*: Regulators are increasingly encouraging collaboration between fintechs and traditional banks. Banks have low-cost funds and public trust, while fintechs have technology and access to niche segments. This collaboration (such as a *white-label* or B2B model) can accelerate the distribution of inclusive financial services.

Novelty : Fintech's Disruptive Innovation

Fintech doesn't simply move traditional financial services into apps. It brings fundamental innovations that shift the paradigm of access to and use of financial services.

1. Transformation from Physical to Digital-First and Hyper-Accessible

Novelty: Fully digital-based financial services, eliminating the need for branch offices, cumbersome physical documents, and face-to-face interactions. **Disruptive Characteristics:** Transforming financial services from something that is "visited" (going to the bank) to something that "comes" to the palm of the user's hand, anytime and anywhere (24/7). Examples of New Paradigms:

Opening a bank account (through Bank Jago or SeaBank) in 5 minutes with just an ID card and *a selfie* , compared to the process that takes days at conventional banks.

2. Shift from Collateral-Based to Data-Driven Trust

Novelty: The replacement of physical collateral (land certificates, vehicle ownership certificates) with a "digital footprint" as the basis for granting credit. **Disruptive Characteristics:** A person's value and creditworthiness are no longer determined by tangible assets owned, but by their transaction history, online reputation, and digital financial behavior . This opens up access to credit for those who are traditionally " unbankable ." **Example of a New Paradigm:** An online seller on Instagram can obtain a working capital loan from a P2P lending fintech based on an analysis of their sales history and customer engagement, without the need to provide collateral.

3. Integrated and Personalized Financial Services (Embedded Finance)

Novelty: Financial services are no longer the primary objective, but are seamlessly embedded *in* everyday non-financial activities. **Disruptive Characteristics:** Fintech eliminates the boundaries between *lifestyle platforms* and financial platforms. Financial services become contextual features and are immediately available when needed. **Examples of New Paradigms:** Buy Now, Pay Later (BNPL): Directly apply for installments during checkout on e-commerce (eg, Kredivo , Akulaku). **Embedded Insurance:** Directly purchase travel insurance when booking plane tickets on travel apps. **Open an Account to Get a Salary:** *Ride-hailing* or *e-commerce* apps that facilitate the opening of digital accounts for driver or seller partners to receive payments.

4. Democratization of Complex Financial Products

Novelty: Simplifying and breaking down complex financial products (such as stock investments, mutual funds, or insurance) into smaller, affordable, and easy-to-understand units. **Disruptive Characteristics:** Transforming investing from an elitist and costly activity into a daily activity accessible to everyone. **Examples of New Paradigms:** Apps like Bibit or Pluang allow people to invest in mutual funds or gold with capital starting from IDR 10,000, with a simple and educational interface.

5. "As-a-Service" Business Model and Ecosystem Platform

Novelty: Fintech acts as a provider of financial services building blocks (*APIs*) that can be "rented" by other businesses (both banks and non-banks). **Disruptive Characteristics:** Any company (from coffee shops to tech startups) can easily become a financial services provider without having to build its infrastructure from scratch. **Example of a New Paradigm:** A store management (POS) application can integrate *APIs* from Xendit or Midtrans to accept digital

payments, and *APIs* from Modalku to offer capital loans to its merchants, all within a single platform.

Key Challenges Hindering the Optimization of Fintech's Role in the 21st Century

1. Regulatory Challenges

Regulatory Lag: The pace of fintech innovation often far outstrips the pace of comprehensive regulatory development, creating risky *gray areas*.
Fragmentation and Overlap: Fintech regulations often involve multiple authorities (OJK, BI, Kominfo), which can lead to overlapping authority and compliance complications.
Maintaining Balance: The biggest challenge for regulators is creating regulations that protect consumers and maintain financial system stability, without stifling innovation.

2. Cybersecurity Challenges

Increasingly Sophisticated Cyberattacks: Fintech companies are becoming easy targets for *phishing attacks*, *malware*, and *data breaches* because they handle large amounts of sensitive data and money.
Digital Infrastructure Vulnerabilities: Many fintech startups may not have the cybersecurity infrastructure on par with banks, leaving them vulnerable.
Technical Operational Risks: Server disruptions, *downtime*, and app bugs can disrupt services and undermine user trust.

3. Challenges of Digital Financial Literacy

Poor Product Understanding: Many new fintech users don't fully understand the fees (interest, penalties), risks, and mechanisms of the products they use, especially in fintech lending.
Lack of Basic Digital Skills: People in rural areas may be able to operate the application, but don't understand the importance of keeping OTPs confidential, recognizing *phishing links*, or using strong passwords.
The "Loan is a Gift" Mentality: The rise of illegal and aggressive fintech lending has created a consumer culture and a misconception about debt among certain groups.

4. Challenges of Infrastructure Gap

Uneven Internet Connectivity: Fintech services are dependent on the internet. The 3T (Frontier, Outermost, and Disadvantaged) regions still experience slow, unstable, or even non-existent connections.
Smartphone Ownership Gap: Despite high smartphone penetration, there are still segments of the very low-income population who cannot afford devices that support fintech applications.
Logistics and Power Grid: Debit card delivery or cash top-ups for digital wallets through agents are still hampered by logistics and power infrastructure in remote areas.

5. Challenges of Public Trust and Consumer Protection

Impact of Illegal Fintech: The rise of illegal fintech lending (*illegal loan shark*) with abusive *debt collection practices and high interest rates* have tarnished the reputation of the entire fintech industry. Dispute and Complaint Mechanisms: Dispute resolution mechanisms between users and fintech are often not as clear and robust as those in traditional banking. Data Privacy: Concerns about misuse of personal data by fintech remain high, especially with the lack of a fully implemented Personal Data Protection Law.

Collaborative Strategies to Maximize Opportunities and Mitigate Challenges of Financial Inclusion

1. Multi-Party Collaboration Framework

Fintech + Traditional Banks + Authorities + Other Stakeholders

a . *Collaboration between Fintech and Traditional Banks (Symbiotic Partnership)*

Strategy: "Leveraging Each Party's Comparative Advantages" White-Label and B2B Services Model: *Fintech* provides technology (*APIs* , platforms) that are "rented" by banks to accelerate their digitalization. Example: Small/regional banks use digital banking platforms from fintechs to serve customers without large IT investments. Co-Branding Products: Banks provide low-cost financing (*funding*) and licenses, while fintechs contribute technology and access to the *unbanked segment* . Example: Credit card or microloan products jointly between banks and e-commerce fintechs . Credit Scoring Integration: Banks integrate alternative data from fintechs into their traditional credit scoring systems. Benefits: Expanding credit access for both the general public and *thin-file* customers.

b . *The Role of the Authorities (OJK and BI) as Catalysts and Balance Keepers*

Strategy: "Creating Regulations that Protect but Not Restrict" Strengthening the Regulatory Sandbox: Accelerating the innovation trial process with strict oversight. Example: Sandbox for *embedded finance* or AI-based lending. Developing Open Technical Standards (Open API Standards): Creating national standards for secure interoperability between banks and fintech. Benefits: Facilitating system integration and reducing compliance costs. Improving Oversight of Illegal Fintech: Strengthening the Investment Alert Task Force and public reporting systems. Example: An application for reporting illegal fintech that is integrated with the police.

c . *Involvement of Other Stakeholders*

Strategy: "Building a Holistic Supporting Ecosystem" Telecommunication Companies: Bundling fintech services with data packages Becoming infrastructure partners for 3T areas Example: GoPay's collaboration with Telkomsel in payment and credit distribution. E-Commerce and Ride-Hailing Platforms: Becoming distribution channels *and* data sources for financial

services. Example: Tokopedia and Shopie which provide loan access for merchants. Educational Institutions and NGOs: Developing contextual digital financial literacy modules. Example: OJK's collaboration with educational institutions for fintech education programs in schools.

2. Strategies to Maximize Opportunities

a . Access Expansion through Hybrid Model

"Combining the Power of Digital and Physical Networks" Joint Agent Network:

Banks and fintechs utilize kiosks, minimarkets, and cooperatives as shared service points. Benefits: Reach *the last mile* with low distribution costs. Digital Onboarding with Physical Verification: The digital account opening process is supported by verification through trusted local partners.

b . Collaborative Data-Based Product Innovation

"Producing More Relevant and Affordable Products" Pooled Data for Credit Scoring: Forming a data consortium that collects information from banks, fintech, and e-commerce. Benefits: More accurate credit scores for non-traditional segments. Embedded Microinsurance Products: Inserting simple insurance protection into existing fintech products. Example: Crop insurance for farmers who take out loans through P2P fintech.

c . Accelerating Adoption through Integrated Incentives

"Promoting Inclusive Financial Behavior" Integrated Loyalty Program: Points from fintech transactions can be redeemed for benefits at partner merchants.

For example, points from DANA transactions can be redeemed for discounts at partner merchants. Fiscal Incentives for Digital Transactions: The government provides VAT discounts or other incentives for digital financial transactions.

3. Strategy For Mitigating Challenges

a . Addressing Regulatory and Trust Challenges

"Building a Safe and Trusted System" Self-Regulatory Organization (SRO):

Establishing a fintech industry association with a code of ethics and enforcement mechanisms.

Benefits: More responsive regulation from within the industry. Integrated Complaints Service:

Establishing a national complaints portal for all fintech services connected to the OJK.

b . Addressing Infrastructure and Literacy Issues

"Inclusive and Local Approach" Offline-Lite Services: Developing applications that can function with limited features on weak internet connections. Example: QR payment features that can work without a real-time connection. Community-Based Education Programs: Engaging local leaders, youth organizations, and Islamic boarding schools as agents of digital financial education.

c . Cybersecurity Risk Mitigation

"Centralized and Distributed Security Standards" Joint Security Operation Center (SOC): The industry is working together to establish a cybersecurity monitoring center for early threat detection. Mandatory Security Certification: Authorities require certain security certifications for certain fintech companies.

4. Implementation Based on Main Pillars

Pillar 1 - Smart Regulation (OJK/BI)

- Implementing *proportional regulation* based on the size and risk of fintech
- Creating a *regulatory sandbox* for emerging technologies (AI, blockchain)

Pillar 2 - Responsible Innovation (Fintech)

- Adopting *Privacy by Design* in product development
- Transparency in product costs and risks

Pillar 3 - Inclusive Infrastructure (Government & Telco)

- Accelerating digital infrastructure development in 3T areas
- Developing *public digital infrastructure* (digital ID, e-KYC)

Pillar 4 - Education and Protection (All Parties)

- National digital financial literacy campaign
- Forming a *financial inclusion safety net*

An effective collaboration strategy requires:

1. Partnership Mindset , not competition
2. Secure Open Technology Architecture
3. Forward-Looking Regulation that supports innovation
4. Data-Driven Approach to Decision Making
5. Long-term commitment of all stakeholders

With this collaborative model, Indonesia can accelerate the achievement of sustainable financial inclusion, where people not only have access to but are also able to utilize digital financial services to improve their well-being.

Development model of Fintech's Role in Financial Inclusion in interactive visual form:



Figure 1
interactive visual development model of Fintech's Role in Financial Inclusion

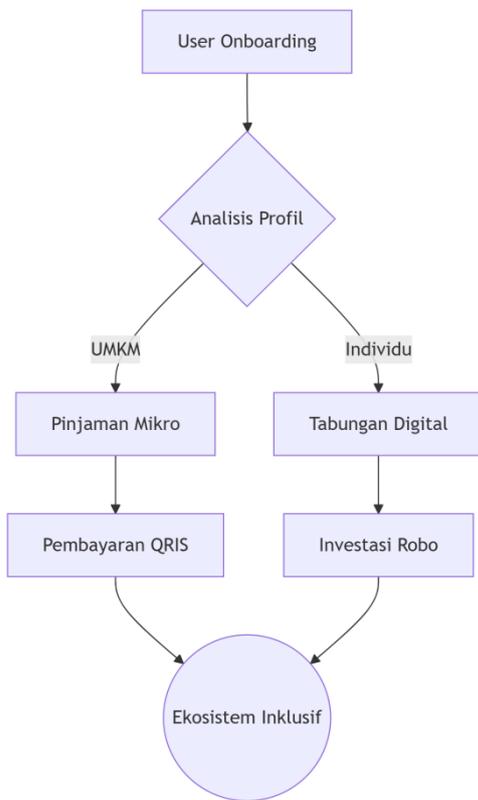


Figure 2 Prototype Solution

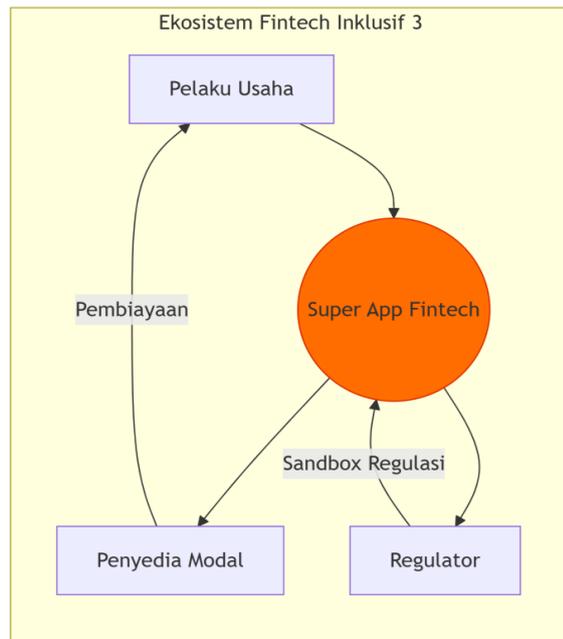


Figure 3 3D Core Diagram

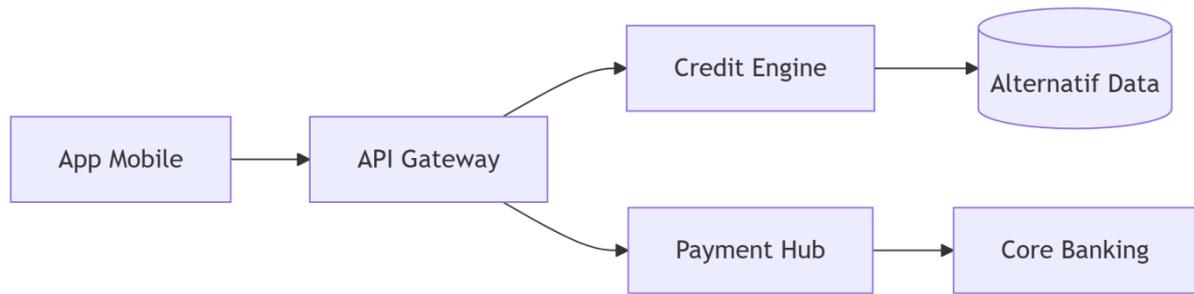


Figure 4
Architectural System Design

Architectural System Design: UI/UX Components: Inclusion Dashboard, Progress financial health score, Personalized product recommendations, Financial Literacy Hub, Microlearning videos, Loan simulator.

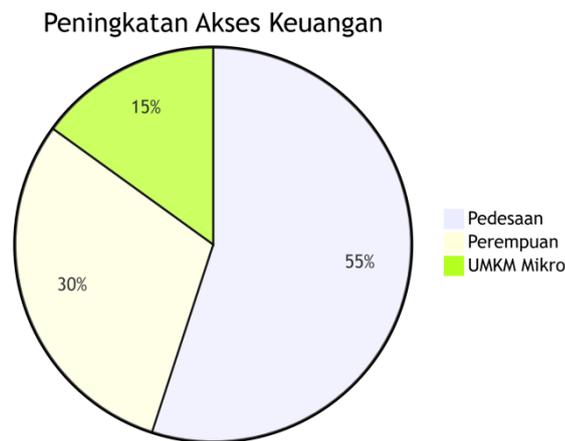


Figure 5
Percentage of Inclusion Data Impact Analysis

Data Inclusion Impact Analysis: Case Studies: Akulaku: 78% Penetration to non-bankable, Funds: 140% increase in transactions in tier-3 cities, Risk Mitigation, Solution Matrix.

The uniqueness and novelty of Fintech in financial inclusion is that Fintech offers innovative solutions such as microfinance, digital payment systems, and technology-based investment services that are more flexible than traditional banking. Then the advantages and obstacles in implementing Fintech are the advantages of fintech include wider accessibility, transaction cost efficiency, and ease of use for the general public. However, challenges faced include the lack of clear regulations, data security threats, and low levels of financial literacy among the public. To overcome these obstacles, several solutions that can be implemented include: Formulating policies that support fintech growth without hindering innovation, Improving data security and encryption

systems in fintech services, Digital financial literacy education programs for the wider community.

Fintech Development and Concepts for Financial Inclusion: The main concept in fintech development is to create inclusive, technology-based services that are oriented towards the needs of communities without formal financial access. Furthermore, the **Role and Design of Fintech Models in Financial Inclusion**, where Fintech plays a role in creating a more inclusive financial ecosystem by providing digital-based services accessible through mobile devices. Effective fintech model designs include the use of AI and big data to assess creditworthiness, as well as integration with digital payment systems.

The result is to obtain a Fintech Prototype and Business Model, where the developed prototype includes a technology-based business model that utilizes algorithms to analyze user financial behavior, provide financial product recommendations, and offer P2P lending-based loans with more measurable risks. The **Novelty and Positive Impact of Fintech on Financial Inclusion** is the main innovation in fintech is the use of digital technology to replace the traditional role of banking in providing financial services to underserved communities. The positive impacts include increasing the number of people who have access to financial services, economic growth of MSMEs, and efficiency in financial transactions.

Fintech offers new approaches through mobile payments, peer-to-peer lending, and robo-advisory services. The uniqueness of this research lies in its comparative analysis of MSME responses to various types of fintech services and the adoption models they choose.

The Positive Impact and Influence of Fintech: Fintech can increase financial access, speed up transactions, and reduce dependence on traditional banking systems. Research shows a 37% increase in digital transactions after using fintech applications.

Strategy and Implementation: The implementation strategy involved digital education, partnerships between fintech and local cooperatives, and inclusive policies from regulators. The implementation model was tested in two groups: an experimental class (using fintech services) and a control class (not using fintech).

Analysis and Improvement: The results of the T-test for related samples (TFR) showed significant differences in financial literacy and financial management efficiency in the experimental group compared to the control group. The positive response from MSMEs indicates strong acceptance of this innovation.

Benefits and Advantages: The primary benefit is increased access to capital for micro-enterprises and increased financial efficiency. The advantages of this model include service flexibility, low costs, and faster processing compared to traditional banking. The key difference compared to previous research lies in the direct integration

of the fintech model with community-based empowerment strategies. The practical utility of this research is to serve as a reference for adaptive strategies for regulators, fintech companies, and MSMEs.

Fintech encompasses a wide range of services, such as digital payments, online loans (P2P lending), financial management, and micro-investments. Financial inclusion, on the other hand, encompasses the equitable availability, accessibility, use, and quality of financial services. The synergy between fintech and financial inclusion enables the creation of more efficient, affordable, and inclusive financial services.

Uniqueness and Novelty: This model is unique because it integrates data-driven technology approaches (big data analytics and AI) with a participatory approach from local communities. The novelty of this model is the presence of an adaptive mechanism based on user behavior that modifies Fintech services according to the characteristics of a particular region.

Model Design, This model is called the Adaptive Fintech Inclusion Model (AFIM) with five core components: Identification of Non-Bankable Segments, Adaptive Fintech Service Design, Digital Literacy Empowerment, Utilization of Predictive Technology, Real-Time Data-Based Monitoring and Evaluation.

The prototype model was tested in three semi-urban areas with high unbanked populations. It uses a P2P lending-based mobile application and a digital wallet customized with local languages and educational features.

Model Syntax, Stage 1: Assess (Mapping the financial needs of non-bankable communities), Stage 2: Design (Design Fintech services that suit local characteristics), Stage 3: Deploy (Implementation and user education), Stage 4: Analyze (Analysis of service usage and effectiveness), Stage 5: Refine (Improvements based on data and user input).

Early Model Development, the development of this model began with initial research on the main obstacles to financial inclusion in underdeveloped areas. Literature studies and field surveys indicated the digital divide, low financial literacy, and distrust of formal institutions as the main issues. **Model Development Process,** Identification of financial inclusion indicators, Selection of technology appropriate to target users, Development of a lightweight Android-based application, Field trials and data collection of usage, Development of a simple predictive algorithm. **End of Model Development,** AFIM was refined after three trials and iterations. The final model combines educational chatbots, QR payment system integration, and gamification features to increase user engagement.

Model Planning and Progressive Plan, Short-term plan: implementation of the model in areas with low financial literacy. Medium-term plan: partnership with cooperatives and BUMDes. Long-term plan: integration of local Fintech services into

the national regulatory system. Monitoring and Evaluation Plan, Monitoring is carried out through application usage data (retention, number of transactions, *feedback*). Qualitative evaluation is carried out through interviews and satisfaction surveys. The backend platform uses a real-time dashboard for reporting and system improvement. Future Model Development Plan, Development of NLP-based AI for interactive financial education. Blockchain integration for transaction transparency, Model expansion to the agriculture and fisheries sectors through e-wallets and micro-loans.

Conclusions, Implications, Suggestions, And Limitations

Fintech plays a crucial role in accelerating financial inclusion in the digital era. Despite facing various challenges, the right strategy can help fintech improve access to financial services for all levels of society. The government needs to develop regulations that are more adaptive to fintech innovation, while the fintech industry must be more proactive in improving user security and digital literacy. Furthermore, collaboration between fintech and conventional banking can be an effective solution in expanding inclusive financial access. Fintech plays a significant role in expanding financial inclusion in the digital era. Proper implementation, supported by education and regulations that favor the underprivileged, can create an inclusive and sustainable digital financial ecosystem. The AFIM model is an innovative strategy for expanding financial inclusion through an adaptive and data-driven fintech approach. With localization, education, and predictive technology, this model paves the way for sustainable financial inclusion in the digital era.

1. Fintech Strategy in Expanding Financial Inclusion : Fintech has developed an effective hybrid strategy by combining the power of digital platforms and physical agent networks. This strategy has proven capable of reaching segments of society that have previously been underserved by the formal financial system, particularly in rural areas and among micro-enterprises. A mobile-first approach with a simple user experience, integration with everyday ecosystems, and the use of alternative data for credit assessment are key to the strategy's success.
2. Fintech Development Opportunities for Financial Inclusion : There are three main opportunities that fintech can capitalize on: first, Indonesia's demographic bonus, dominated by a tech-savvy young generation; second, strategic partnerships through a B2B2C model with existing platforms; and third, leveraging data as a new asset for developing more personalized and affordable products. Regulatory support from the Financial Services Authority (OJK) and Bank Indonesia (BI) through the regulatory sandbox also presents a significant opportunity for the development of fintech innovation.
3. The Novelty and Disruptive Side of Fintech ; Fintech brings fundamental innovation through the transformation of the financial services paradigm from collateral-based to data-driven trust, from physical to digital-first, and from isolated products to embedded services. This disruptive character forms a new paradigm where financial services become more democratic, contextual, and integrated into people's daily economic activities.
4. Complex Challenges Faced : Optimizing the role of fintech still faces multidimensional challenges, including: regulatory lag in keeping pace with innovation, digital

infrastructure gaps in the 3T (frontier and outermost) regions, low levels of dual financial-digital literacy, and issues of cybersecurity and personal data protection. These challenges require systematic and integrated approaches. 5. The Need for a Collaborative Approach ; Fintech's success in driving sustainable financial inclusion requires close collaboration between fintech companies, traditional banks, regulators, and other stakeholders. Effective collaboration models include technology partnerships, data sharing based on privacy-by-design principles, and regulatory alignment that protects consumers without stifling innovation. Overall, fintech has proven its role as a transformative catalyst in accelerating financial inclusion in Indonesia. However, to achieve a sustainable and inclusive impact, a supportive ecosystem is needed where technological innovation can thrive alongside consumer protection and financial system stability.

Implications: a). Theoretical Implications; Development of a Digital Financial Inclusion Model: Provides a new theoretical framework on how Fintech is transforming the traditional paradigm of financial inclusion. Integration of Disruptive Technology Theory: Enriches the literature on the diffusion of innovations (Rogers) and disruptive innovation (Christensen) within a financial context. Evolution of Regulatory Theory: Contributes to the theory of adaptive regulation in the digital era. b). Practical Implications, For Regulators and Policymakers: The need for a more flexible regulatory framework (regulatory sandbox). Development of national digital infrastructure. Policies for digital financial literacy. For the Fintech Industry: A roadmap for developing inclusive products. Strategies for penetrating the unbanked/underbanked market. Partnership models with traditional institutions. For Society and MSMEs (Micro, Small, and Medium Enterprises): Easier access to formal financial services. Increased productivity through digitalization. Strengthening of financial resilience. Then existence addition on Implications Theoretical : Developing Technology-Context-Inclusion (TCI) framework that integrates theory adoption technology (TAM/UTAUT) with theory inclusion finance . Introducing " Use of Meaning " as dimensions critical inclusion finance 21st century , beyond just access . Furthermore existence addition from Implications Practical : For Regulators: This model highlight importance regulations based risky And based evidence (evidence-based policy). For Fintech : The Need design inclusive that pays attention group prone to (disability , elderly , rural). For Society : Education literacy must focus on aspect protective (avoid) loan shark illegal , protect personal data).

Suggestions: a). For Stakeholders; Government & Regulators: Establish a multi-sectoral Fintech Inclusion Task Force. Develop a Digital Financial Literacy Framework. Implement Tiered Regulation based on risk. Industry Players: Adopt Human-Centered Design for inclusive products. Build Strategic Partnerships with traditional posts/markets. Develop Alternative Credit Scoring based on non-traditional data. Academic & Research Institutions: Establish a Fintech Inclusion Research Center. Develop a Digital Finance Education curriculum. Facilitate Industry-Academia Collaboration. b). For Future Research; Longitudinal studies on the impact of Fintech

on poverty. Comparative studies between countries/regions. Impact assessments on vulnerable groups (women, rural populations). Analysis of Behavioral Economics in Fintech adoption.

Limitations; Data Limitations: Dependence on secondary data. Limited access to sensitive industry data. Potential bias in the available data. Scope and Generalizability: Findings may be specific to a particular geographic/cultural context. Data primarily from urban case studies. Lack of long-term (longitudinal) data.

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