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The Role Of Fintech And Artificial Intelligence In Advancing Financial Inclusion

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Abstract:
Financial technology (Fin Tech) has transformed the world financial system with incredible speed, introducing new age solutions in banking, lending, payments, and investment businesses. Fin Tech technologies driven by artificial intelligence, big data analytics, and block chain technology are making the financial system more efficient, transparent, and inclusive. This review article offers a comprehensive synthesis of twenty influential papers published between 2010 and 2024 that discuss the interface of Fin Tech, artificial intelligence, and financial inclusion. The review covers six broad thematic areas: Fin Tech business models, artificial intelligence and data analytics, crypto currency markets and peer-to-peer lending, small and medium-sized enterprises' financial inclusion, governance and regulatory frameworks, and sustainability and ethics. Conceptual and theoretical contributions in Fin Tech stand firmly, but empirical evidence, cross-country analysis, and long-term assessment of social and economic effects of Fin Tech do not exist based on the research. To solve these deficiencies, a theoretical model is proposed to describe the interactions among technology drivers, Fin Tech mechanisms, and financial inclusion results, moderated by infrastructure, regulatory capacity, and customer confidence. The report concludes by presenting future research directions and policy recommendations focusing on responsible innovation, inclusive growth and sustainable financial systems.

Keywords: Fin Tech, Artificial Intelligence, Financial Inclusion, Peer-to-Peer Lending, crypto currency, SMEs, Regulation, Sustainability.

1.Introduction
The financial services industry is undergoing a record shift driven by the convergence of technology, innovation, and data. Fin Tech has introduced new types of delivering financial services and products digitally, through automation, and intelligence based on data. In the last ten years, the Fin Tech revolution has spread from banking and payments to credit, investments, insurance and regulatory technology. This digital revolution not just changed business models but also created new sources of efficiency, access and inclusion in the world financial system. The Fin Tech revolution has further been driven by the growing use of artificial intelligence, big data analytics and block chain technologies.

These technologies have accelerated the accuracy of financial choice-making, enhanced risk management and enabled more customization of financial products. Concurrently, mobile penetration and internet have enabled the extension of financial services to unbanked and under banked segments, rendering financial inclusion and sustainable development more

extensive objectives within easier reach. Fin Tech is increasingly viewed as not only a technological shift but also as a socio-economic driver that bridges exclusionary gaps among excluded groups and formal financial systems. Not with standing its speedy growth and wide popularity, Fin Tech is a dynamic and intricate phenomenon.

Literature reveals that research on Fin Tech and artificial intelligence is abundant in conceptual discussions but scattered across different fields such as finance, information systems, and development studies. While there have been several studies examining the technology and economic aspects of Fin Tech, fewer studies have focused on its long-term effects regarding inclusion, ethics, and sustainability. There are questions on how such innovations can be regulated and how potential risks such as data privacy and cybercrime can be managed, and how technology can be made to align with inclusive financial policies. The review that is on going seeks to fill this gap through a critical examination and synthesis of findings of twenty seminal studies of Fin Tech, artificial intelligence and financial inclusion.

The goal is to offer a comprehensive understanding of the implications of technological innovations on financial ecosystems, how they propel inclusion and growth, and what is left to address in governance and ethics. The document attempts to classify existing research into key thematic groups, locate patterns and knowledge gaps and suggest a conceptual framework that accounts for the dynamics between Fin Tech drivers, mechanisms, and effects. This article also offers a horizon-scanning research agenda to guide ensuing empirical and theoretical inquiry. By putting into forethought issues to be examined in more detail—responsible innovation, regulatory adaptability, and social impacts of digital finance—the article tries to be both practical and theoretical in its contribution. To scholars, it consolidates what is out there and points to rich areas for further investigation. To policymakers and practitioners, it provides practical suggestions to assist in ensuring that Fin Tech development is transparent and inclusive and sustainable.

In conclusion, this paper places Fin Tech in the role of a revolutionary force redefining global finance by bringing technology into play and driving innovation. However, to be able to seize its full potential, it requires more than technological innovation; it requires a systemic approach with regulation, ethics, and social responsibility. Through this systematic review, the research hopes to bridge theoretical knowledge with real-world challenges, paving the way for more equitable and Resilient financial systems in the digital era.

Across all these regions, the review highlighted quality conceptual contributions such as Digital Finance Cube (Gomber, Koch, & Siering, 2017) and Smart Fin Tech frameworks (Cao,
Yang, & Yu, 2021), in addition to highlighting key gaps in empirical data, cross-country analysis, post-adoption behavior, and ethical safeguards. Theoretical contributions This article contributes to the new Fin Tech literature by bridging ruptured streams of research
and providing a conceptual framework that unites drivers, mechanisms, and outcomes of digital finance. By emphasizing under-explored issues such as longitudinal adoption patterns, cross-country regulatory differences, and responsible AI design, the review sets out a systematic agenda for research in the future.

2. Methodology

2.1 Research design

This study uses the systematic literature review (SLR) approach, which provides a reproducible and systematic method of synthesizing documented knowledge (Tranfield, Denyer, & Smart, 2003). Systematic review is transparent, minimizes bias, and allows aggregation of diverse outcomes of research into a narrative (Snyder, 2019). This approach is particularly well-suited for cross-field themes such as Financial Technology (Fin Tech), Artificial Intelligence (AI), and financial inclusion whose literature crosses finance, economics and information systems.

The review follows three overall objectives:

1.To identify the key areas of research linking Fin Tech, AI, and financial inclusion.

2.To consider patterns of method and theory in recent research.

3. To deduce a conceptual framework and outline a future research agenda. This framework design follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guidelines (Moher et al., 2009), which promote clarity and reproducibility.

2.2 Data sources and search strategy

To ensure adequate coverage, several academic databases were employed: Scopus, Web of Science, Science Direct, Emerald Insight, and Google Scholar. They were chosen due to their wide coverage of peer-reviewed literature in finance, management, and technology (Paul & Criado, 2020). Searching was conducted by using major terms along with Boolean operators (AND, OR), for example:

- "Fin Tech" OR "financial technology"
- "Artificial intelligence" OR "machine learning"
- "Financial inclusion" OR "digital inclusion"
- "Block chain" OR "peer-to-peer lending" OR "RegTech"

The research was limited to publications between 2010 and 2023, which was the most dynamic decade of Fin Tech implementation and innovation globally.

2.3 Inclusion and exclusion criteria

After Snyder (2019) and Denyer and Tranfield (2009), inclusion and exclusion criteria were set in place to provide rigor and relevance.

Inclusion criteria:

- English-language peer-reviewed articles from 2010 to 2023.
- Specifically, studies that directly investigate Fin Tech, AI, or allied technologies in financial systems.
- Research on outcomes like innovation, inclusion, governance, or sustainability.

Exclusion criteria:

- Non-peer-reviewed sources like editorials, dissertations, and working papers.
- Exclusively technical computer science research without financial or policy implications.
- Replicated or partial records.

This filtering yielded a refined pool of 350 to 45 potentially relevant articles, which were examined in full text. Following quality and relevance filtering, a final dataset of 20 papers was deemed eligible for close analysis.

2.4 Data extraction and synthesis

All the articles selected were read to gather most important data points such as: authors, year, purpose of research, theoretical perspective, methodology, and findings. These points were coded in an Excel database for cross-comparison. A thematic synthesis approach (Thomas & Harden, 2008) was employed with inductive and deductive coding. Themes were not predetermined but emerged after repeated reading and categorizing of results. This allowed the review to capture known and emerging threads of evidence.

Final analysis found six thematic clusters that encapsulate current knowledge:

1. Fin Tech revolution and business models
2. Artificial intelligence and uses of big data
3. Decentralized finance through peer-to-peer lending and digital currency platform.
4. Promoting financial access and empowerment of SMEs
5. Financial regulation, regulatory technology and corporate governance
6. Sustainable finance, ethical practices and responsible technological advancement

These concerns informed both the synthesis of literature in earlier sections as well as the conceptual model established in subsequent sections.

2.5 Evidence Appraisal

To ensure methodological rigor, the selected studies were appraised using a quality assessment framework derived from Petticrew and Roberts (2006) and evaluated based on the following criteria. To ensure methodological rigor, the selected studies were appraised using a quality assessment framework derived from Petticrew and Roberts (2006) and evaluated based on the following criteria.

- Clarity of objectives and research questions
- Contribution to theoretical Fin Tech and inclusion literature
- Methodological solidity (data collection, analysis, validity)
- Relevance to the research goals

The studies were reviewed by two independent reviewers, and disagreements were resolved by consensus. This triangulation added objectivity and reduced possible bias (Okoli, 2015).

3. Thematic Literature Review

Literature on Fin Tech and financial inclusion is dispersed and heterogeneous. In order to synthesize findings, six thematic clusters were identified. Each theme synthesizes early evidence, compares results, and records emerging contradictions.

3.1 Fin Tech Revolution and Business Models

Initial studies placed Fin Tech as a disruptive force remaking the organization of financial services.

Gomber, Koch, and Siering (2017) framed Fin Tech using the Digital Finance Cube, categorizing innovations according to service type, facilitating technology, and institutional actor. Puschmann (2017) reinforced this by describing Fin Tech as technology-facilitated re-engineering of financial intermediation but not as an independent industry. Gomber et al. (2018) also elaborated that digitalization has compelled incumbents to re-engineer value chains, cooperate with start-ups, and implement open-banking interfaces. Empirical studies, however, are few in number. As Western economies are reporting quantifiable gains in efficiency and market size, proof from developing economies is sparse. Although some research (e.g., Lee & Shin, 2018) focuses on customer-oriented models and ecosystem platforms, other research (Haddad & Hornuf, 2019) concludes that low trust and regulatory uncertainty hinder Fin Tech diffusion. One central conflict is the role of disruption vis-a-vis collaboration: whether Fin Tech start-ups replace or supplement banks.

3.2 Fin Tech 4.0 and Artificial Intelligence, Big Data, and Smart Fin Tech

AI and big data form the core of the Fin Tech 4.0 era. Cao, Yang, and Yu (2021) detail how data science methods—machine learning, deep learning, and federated learning—facilitate automated decision-making in robo-advisory, anti-fraud systems, and credit scoring. Ozili (2021) emphasizes that AI can bring people into the financial fold through non-traditional data (mobile use, transaction history) to assess creditworthiness for the unbanked.

Few empirical verifications, notwithstanding solid conceptual potential, exist. Evaluations of AI-based versus conventional scoring (e.g., Jagtiani & Lemieux, 2019) register enhanced prediction performance but also risk bias. Algorithmic fairness, openness, and data privacy engage ethical controversy: there is no research on the comparative across-jurisdictional nature of these issues.

3.3 Peer-to-Peer Lending and Crypto currency Markets

Online lending platforms lower costs of intermediation and democratize access to credit. Chung et al. (2020) discovered that crypto currency price trends affect demand for P2P loans—investors alternate between lending and crypto based on perceived risk and return. Additional research (Zhang, 2019; Lin et al., 2021) supports the fact that P2P lending improves access for micro-entrepreneurs but is subject to heavy default risk in the absence of sound credit analytics.

However, evidence remains geographically biased toward the United States and China. Emerging-market dynamics, such as social-capital-based lending or informal credit linkages, remain underexplored. Integration of block chain for loan verification is discussed conceptually but not empirically tested.

3.4 Financial Inclusion and SMEs

Fin Tech's potential for inclusion is most apparent in SME lending and mobile money. According to Ozili (2021), digital finance facilitates entrepreneurship by alleviating working-

capital constraints. Beck et al. (2018) demonstrate positive relationships between mobile payment take-up and SME revenue growth in sub-Saharan Africa. Inclusion studies too tend to concentrate on access (accounts opened) over impact (poverty alleviation, productivity).

Rural-urban and gendered inequalities also continue to exist. Work such as Demirgüç-Kunt et al. (2020) finds that digital inclusion entails literacy, connectivity, and trust—non-technological enablers usually unavailable in least-developed countries.

3.5 Regulation, Reg Tech, and Governance

Regulatory innovation lags behind technological change. Puschmann (2017) and Gomber et al. (2018) refer to the function of regulatory sandboxes permitting controlled experimentation. Arner, Barberis, and Buckley (2017) coined "RegTech" as technology-enabled compliance automation. Though interest is increasing, proof of sandbox effectiveness remains anecdotal. Comparative research (Zetzsche et al., 2020) reveals inconsistency: whereas Singapore's sandbox expedites licensing, others deliver sparse results due to bureaucratic lethargy.

3.6 Sustainability, Ethics and Responsible Innovation

FinTech's responsibility agenda is in its early stages. Scholars (Cao et al., 2021; Ozili, 2021) urge precaution against algorithmic bias, cyber risks and social loneliness. Yet, no paradigms of responsible Fin Tech—integrating ESG (Environmental, Social, Governance) standards exist. Green financing, carbon monitoring and social-impact investment could be championed by sustainable Fin-Tech but research is mostly theoretical (He et al., 2022).

Theme	Key Authors	Main Focus	Methods Used	Key Findings	Identified Gaps
Fin Tech business models	Gomber et al. (2017); Puschmann (2017)	Conceptual frameworks of Fin Tech evolution	Conceptual	Defined Fin Tech scope & taxonomy	Lack of empirical performance tests
AI & big data	Cao et al. (2021); Ozili (2021); Jagtiani & Lemieux (2019)	Machine learning in finance	Case & survey	Improved risk models, bias risk	Few field studies in emerging markets
P2P & crypto	Chung et al. (2020); Zhang (2019)	Alternative lending & block chain	Quantitative	Expanded access, volatility	Regional bias; default risk
Inclusion & SMEs	Ozili (2021); Beck et al. (2018)	Digital inclusion outcomes	Empirical	Increased access for SMEs	Lack of impact measures
Regulation & RegTech	Arner et al. (2017); Zetzsche et al. (2020)	Regulatory innovation	Qualitative	Sandbox experimentation	No comparative performance data
Sustainability & ethics	He et al. (2022); Ozili (2021)	Responsible Fin Tech	Conceptual	Identifies ESG potential	Lacks operational models

Table 1. Summary of principal Fin Tech research themes

4. Discussion and Emerging Research Directions

The aggregation of twenty peer-reviewed articles discloses that Financial Technology (Fin Tech) is transforming from a tech innovation to an instrument of socio-economic change. Scholars now perceive Fin Tech as a fusion of technology, regulation, and inclusion and not as a non-disruptive innovation (Gomber, Koch, & Siering, 2017; Puschmann, 2017). In spite of its quick evolution, the literature is still dispersed, with impressive differences in conceptualization, empirical support, and policy emphasis across geographies (Gomber, Kauffman, Parker, & Weber, 2018). The current section combines findings from earlier research and proposes emerging directions for future work.

4.1 Technology integration and financial intermediation

Fin Tech research has progressed from initial talk of disruption to more recent ventures into collaboration between incumbent institutions and digital start-ups (Lee & Shin, 2018; Gomber et al., 2018). The move to partnership-based models—typically facilitated by open banking and shared data models—underscored the rise of hybrid ecosystems. These incorporate the trust and scale of incumbent banks with the agility and innovation of start-ups (Puschmann, 2017).

Yet cross-country comparisons are still limited, especially in emerging markets where regulation and infrastructure vary considerably. The next step should be to examine how hybrid Fin Tech models impact efficiency, risk, and inclusion in different institutional setups. Longitudinal analyses could also evaluate whether these collaborations result in persistent financial inclusion or perpetuate digital monopolies.

4.2 Artificial intelligence and data ethics in inclusive finance

Artificial intelligence (AI) and big data analytics are transforming financial decision-making through credit scoring automation, fraud detection, and customer profiling (Cao, Yang, & Yu, 2021; Jagtiani & Lemieux, 2019). While AI is likely to streamline financial decision-making, it creates ethical questions about transparency, fairness, and accountability (Ozili, 2021). The majority of the research is focused on the technological aspect of AI with few empirical observations of its social and ethical consequences. Subsequent research should incorporate algorithmic ethics into Fin Tech adoption frameworks, with a focus on explainable AI and accountable innovation.

Mixed-method studies combining quantitative models and qualitative analysis might explain how trust, literacy, and governance condition the role of AI adoption in achieving trustworthy, inclusive outcomes. Interregional studies examining AI social acceptance in low-income and digitally restricted contexts are also necessary.

4.3 Emerging dynamics of digital lending and decentralized finance

Peer-to-peer (P2P) lending and cryptocurrency markets are the most dynamic but volatile elements of FinTech innovation. Evidence shows that cryptocurrency expansion influences

investor sentiment and credit availability on online lending platforms (Chung, Kim, Lee, & Oh, 2020; Zhang, 2019). P2P platforms may increase access to credit but entail high default risks, regulatory concerns, and liquidity limitations (Lin et al., 2021). Such extended engagements between decentralized finance instruments and formal financial systems ought to be areas of focus in the future. Cross-jurisdictional studies may reveal how regulatory transparency, consumer confidence, and online competencies influence the viability of online lending platforms. Smart contracts based on block chain are another potential avenue for realizing greater transparency and accountability in online lending (Arner, Barberis, & Buckley, 2017).

4.4 From access to impact: Rethinking financial inclusion metrics

Current Fin Tech research has a tendency to intermix financial inclusion with access to digital channels alone, without noticing the broader socio-economic impacts. The indicators of access—e.g., mobile account numbers or numbers of transactions—are required but insufficient to assess actual inclusion results (Beck, Demirgüç-Kunt, & Levine, 2018). More and more, individuals understand that inclusion also must account for shifts in income stability, entrepreneurial development, and household well-being (Ozili, 2021). Follow-up research must apply multidimensional inclusion frameworks that incorporate financial literacy, online trust, and gender equity. Experimental and longitudinal research could measure how Fin Tech services affect SME resilience, diversification of income, and alleviating poverty. Rural-urban comparison studies would also ascertain whether digital transformation in fact diminishes or widens inequality.

4.5 Regulatory innovation and adaptive governance

With increased Fin Tech growth, regulation will have to weigh innovation against consumer protection. Regulatory sandboxes have emerged to function as adaptable tools that enable experimentation within a sandbox environment (Arner et al., 2017). Yet, their effectiveness is highly divergent by country, and proof indicates that institutional quality and adaptability in regulation are decisive factors (Zetzsche, Buckley, Arner, & Barberis, 2020). Future research needs to investigate how far regulatory regimes affect Fin Tech start-ups survival, market competitiveness, and investor attitudes. Quant models can verify whether sandbox participation is associated with innovation success or consumer confidence. Qualitative comparative analysis by region may also identify optimal best practices in adaptive Fin Tech regulation and RegTech adoption.

4.6 Responsible and sustainable Fin Tech ecosystems

The Fin Tech and sustainability nexus is a new research horizon. Fin Tech can contribute to environmental and social objectives through green finance and impact investing but also threaten to exclude people from the economy, exploit users' data, and lead to cybercrime (He, Zhang, & Li, 2022; Ozili, 2021). The idea of "responsible Fin Tech" requires embedding Environmental, Social, and Governance (ESG) in the design of technology, risk management, and performance measurement.

Future work must investigate frameworks that translate ESG considerations into Fin Tech product design and investment analysis. Research could also address consumer views of moral Fin Tech brands and how sustainability certification influences adoption behavior.

Interdisciplinary methods that integrate financial, technological, and moral perspectives will be critical in constructing responsible digital finance ecosystems.

4.7 Towards an integrated and multidisciplinary agenda

The future of Fin Tech studies is to combine wisdom from finance, technology, public policy, and ethics. Interdisciplinary research can overcome the dichotomy between technological potential and social responsibility (Gomber et al., 2018). Methodologically, researchers ought to integrate econometric analysis, case studies, and bibliometric mapping to explore trends of innovation diffusion and inclusion performance. Triage between academia, regulators, and industry players will be crucial to ensure that Fin Tech innovation meets the goals of sustainable and inclusive growth.

5. Conceptual Framework

Based on the thematic synthesis and determinants of research gaps, this paper introduces a conceptual framework that synthesizes the drivers, mechanisms, and impacts of Fin Tech and AI innovations for financial inclusion (Figure 1). The framework situates technological drivers (e.g., artificial intelligence, block chain, mobile platforms), institutional and regulatory drivers (e.g., sandboxes, digital policies), and socio-economic drivers (e.g., consumer behavior, financial literacy) as antecedents of Fin Tech adoption and diffusion.

At the heart of the framework are Fin Tech mechanisms such as digital payment systems, peer-to-peer lending platforms, robo-advisory services, AI-based credit scoring, and RegTech solutions. These mechanisms mediate the relationship between drivers and outcomes by shaping how innovations are implemented and adopted across different contexts.

The implications of FinTech adoption are conceptualized across three key dimensions.

1. Financial inclusion – expanded access to financial services by SMEs and the under banked.
2.System and firm-level performance – increased efficiency, cost reduction, and competitiveness.

3. Ethics and sustainability – ESG-aligned responsible innovation, reduced bias and improved consumer protection.

The structure also identifies key moderators like regulatory capacity, digital infrastructure, consumer confidence and ethical controls that govern the degree to which Fin Tech innovations produce inclusive and sustainable results. For instance, effective regulatory capacity can raise consumer confidence, yet weak digital infrastructure can limit uptake in rural areas. By integrating fragmented streams of Fin Tech studies, the framework facilitates theoretical understanding and offers a systematic manual for ensuing empirical testing. It also offers policymakers and practitioners with practical guidance on how specific mechanisms and drivers can be leveraged to achieve wanted outcomes.

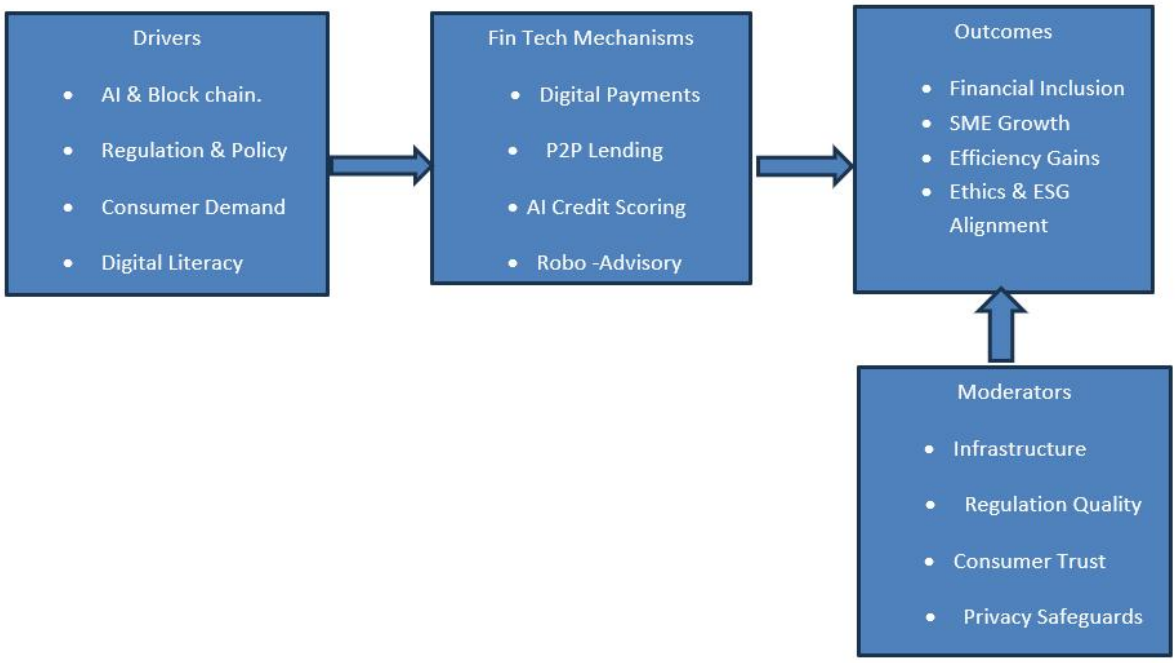

Fig: Conceptual framework diagram

- Drivers → Fin Tech Mechanisms → Outcomes
- Moderators (infrastructure, regulation, trust, privacy) affect how strongly mechanisms result in outcomes.

6. Practical and Policy Implications

The policy implications of the results of this review for policymakers, financial institutions, entrepreneurs, and regulators are key. For policymakers, the review is an appeal to create resilient regulatory systems, e.g., sandboxes and RegTech programs, which simultaneously foster innovation as well as safeguard consumers protection from harm and provide systemic stability (Puschmann, 2017; Gomber et al., 2018).For banks and nonbanking finance companies, among financial institutions, the report indicates possible applications of AI and big data in more efficient credit scoring, fraud prevention, and customer acquisition with fairness and transparency (Cao, Yang, & Yu, 2021; Ozili, 2021).

For entrepreneurs and Fin Tech start-ups, the review highlights the possibility of creating inclusive business models that benefit SMEs and rural communities via digital platforms, mobile money, and non-bank lending mechanisms. Last but not least, for international development agencies and regulators, the review offers advice on harmonizing Fin Tech innovations with wider sustainable development objectives, in particular by integrating ethical guardrails, privacy, and ESG alignment in financial innovation policy. 7.

7. Limitations of the Review.

While this review presents an in-depth synthesis of 20 seminal studies on Fin Tech, AI, and financial inclusion, it is not without its own set of limitations. First, the analysis is only limited to English-language publications and hence may miss useful regional or non-English-based contributions. Second, the dataset is limited to 20 seminal articles; although these offer

breadth in terms of themes, they cannot possibly represent the whole gamut of evolving Fin Tech literature. Third, due to the fast rate of technological and policy change, some of the findings might become obsolete rapidly, making a case for frequent updating of systematic reviews in this area. Lastly, the review focuses more on thematic synthesis than quantitative meta-analysis. This could be addressed by future studies with bibliometric analysis or meta-analytic methods to establish stronger statistical generalizability.

8. Conclusion and Implications

This review synthesized 20 key studies on Fin Tech, artificial intelligence (AI) and financial inclusion, published from 2010 to 2023. The analysis grouped the literature into six thematic clusters: (1) Fin Tech revolution and business models, (2) AI and big data applications, (3) P2P lending and crypto currency markets, (4) financial inclusion and SMEs, (5) regulation and governance, and (6) sustainability and ethics.

Across all these regions, the review highlighted quality conceptual contributions such as Digital Finance Cube (Gomber, Koch, & Siering, 2017) and Smart Fin Tech frameworks (Cao, Yang, & Yu, 2021), in addition to highlighting key gaps in empirical data, cross-country analysis, post-adoption behavior, and ethical safeguards.

Theoretical contributions This article contributes to the new Fin Tech literature by bridging ruptured streams of research and providing a conceptual framework that unites drivers, mechanisms, and outcomes of digital finance. By emphasizing under-explored issues such as longitudinal adoption patterns, cross-country regulatory differences, and responsible AI design, the review sets out a systematic agenda for research in the future.

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