Mapping Pathways for Inclusive Digital Payment Ecosystems: Integrating NGOs, Micro-Insurance Startups, and Community Groups

SAMIR N. AJANI, SAURABH SAOJI, SHIVGANGA. C. MAINDARGI, PODILAPU HANUMANTHA RAO, RAJENDRA V. PATIL, DIVYA S KHURANA

Abstract: *This paper provides an analytical framework to guide the development of inclusive digital-payments ecosystems for the poor in peri-urban areas. This article has addressed the heterostructuration33 of supply chain in the form of a multiscale coalition between international NGOs, micro-insurance start-ups and local savings groups, pro duction value and the governance regime product/structured by local merchant agents. Through concept map-ping and integrative ecosystem modelling, this framework thematically maps partnership archetypes, resource sharing partnerships, and risk coping instruments at the system level to facilitate the delivery of bundled microinsurance products and digital payment services. Drawing on evidence-based digital financial inclusion and participatory ecosystem design good practice, the framework shows strong correspondences between the robustness of the partnership configuration and classification system, and is intended to support the scaling of models that are replicable and scalable. The context can be in particular: Policy recommendations will concentrate on how to enhance the coordination of actions and power-sharing which are directly proportional as what should not be, how to address (e.g. power asymmetry, the breakdown in communication of coordination mechanisms, etc.) A key contribution of this paper is a work taxonomy, which offers actionable insights to practitioners in the field a policy maker towards designing, replicating, and scaling impactful, real-world designed, stakeholder driven digital e-payment architectures for financial inclusion.*

Samir N. Ajani (samir.ajani@gmail.com) School of Computer Science and Engineering, Ramdeobaba University (RBU), Nagpur, Maharashtra, India.
Saurabh Saoji (saurabh.saoji22@gmail.com) Department of Computer Engineering, Nutan Maharashtra Institute of Engineering and Technology, Pune, Maharashtra, India
Shivganga. C. Maindargi (shivganga.maindargi@bharatividyapeeth.edu) Bharati Vidyapeeth (Deemed to be) University, Pune Abhijit Kadam Institute of Management and Social Sciences, Solapur, Maharashtra, India
Podilapu Hanumantha Rao (podilapuat23275@gmail.com) Department of Commerce & Management Studies, Andhra University, Visakhapatnam, India
Rajendra V. Patil (patilrajendra.v@gmail.com) Department of Computer Engineering, SSVPS Bapusaheb Shivajirao Deore College of Engineering, Dhule (M.S.), India,
Divya S Khurana (divya@sharmas.biz) Chandigarh Group of Colleges, Jhanjeri, Mohali, Chandigarh Law College, Punjab, India

Keywords: Conceptual Mapping, Digital Financial Inclusion, Multi Stakeholder Partnership, Micro-Insurance, Community Savings Groups, Ecosystem Governance

Introduction

Affordable and widely accessible digital payment systems have become an important means to provide basic financial services to poor excluded people, particularly in peri-urban areas where formal banking services are still lacking. The provision of a collaborative response by partnering local and international NGOs, micro insurance startups, and community savings groups through merchant agents appears to be quite innovative to fill the access, affordability and trust gaps of DFPS (Ge et al., 22; Cobian et al., 24; Sors et al., 23). Yet successful multisector partnerships that deliver on this potential also depend on a clear understanding of how actors are positioned to contribute or capture value, the means by which value is exchanged and how to design governance structures that both maintain operational coherence and align partners around common goals. This paper presents a conceptual framework for mapping and analysing these pathways by drawing on learnings from digital financial inclusion, ecosystem development and participatory development to facilitate structured partnerships. The study will develop a taxonomy of actor relationships, resource sharing archetypes and guidance for policy makers and practitioners to build a culture of trust, risk mitigation and support a sustainable scaling up of inclusive digital payment services.

Background and Motivation

Achieving any of this is however going to require disruptive models that don't force fragmentation of the delivery of DFS to poor people. It is questionable if conventional approaches are able to sufficiently respond to the raft of vulnerabilities and transactional impediments that the underserved (on which markets could be built – the underbanked and unbanked) experience in peri-urban contexts, particularly in relation to trust, risk mitigation and access to relevant forms of affordable finance (Valladares-Castellanos et al., 2024; Ge et al., 2022). Decosimo et al., Forthcoming) Multi-sector partnerships combining INGOs, micro-insurance start-ups and community savings groups provide a promising platform for consolidating complementary resources, distribution system and local knowledge to deliver integrated service packages that may increase resilience and reduce exclusion (Sors et al., 2023). The rationale for this is the vulnerability, perceived as inherent in less structured collaboration: lack of governance, competing interests and the risk of failure to continuance; which based on a systematic mapping of actor roles and integration, enable lessons learned to be shared, disseminated and scaled to maximum effect (Perrone et al., 2023).

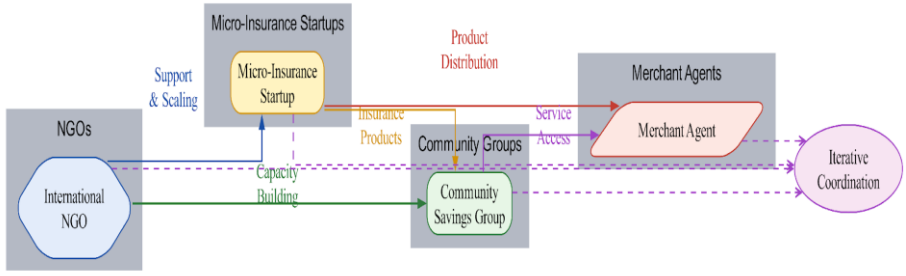

Figure 1. Conceptual map illustrating the main actors—international NGOs, micro-insurance startups, and community savings groups—and their high-level relationships within an inclusive digital payment ecosystem.

This figure (1) presents a synthesized conceptual map of the principal actors and their relationships crucial to the formation of inclusive digital payment ecosystems as motivated in this study.

Research Objectives and Questions

The core goal of the current study is to establish a conceptual framework through which to organize and understand multisector partnerships conducive to an inclusive digital payment ecosystem for the low-income peri-urban communities. The research aims to analyze the interactions between international NGOs, micro-insurance startups, and community savings groups to understand the configurations and value exchanges and governance structures of the actors necessary to facilitate the provision of bundled digital payment and insurance services. In this study, I will focus on the following questions: How can actors from various sectors best organize and govern their partnerships to promote financial inclusion? What drives the modes of sharing resources, mitigating risks, and sustaining the exchanges in such multi-actor digital financial systems.

Literature Review

Table 1. Comparative Overview of Approaches in Inclusive Digital Payment Ecosystems

Approach	*Stakeholder Involvement*	*Key Outcomes*	*Challenges*	*Example Applications*
Digital Financial Inclusion	NGOs, community	Improved rural	Heterogeneity across	Rural China, peri-urban

	groups, startups	integration, greater access	regions, data gaps	financial services
Micro-Insurance Models	NGOs, insurance startups, small merchants	Enhanced risk-sharing, resilience	Regulatory barriers, trust, scaling	Community savings groups, agri-insurance in Asia
Multi-Stakeholder Partnerships	NGOs, local governments, merchants, fintechs	Ecosystem development, policy innovation	Coordination, sustainability, resource allocation	Watershed management, climate adaptation programs
Peri-Urban Digital Merchants	Local enterprises, payment service providers	Expanded acceptance, digital literacy	Interoperability, affordability, network effects	Mobile money integration, merchant onboarding

This table (1) provides a cross-sectional comparison of key models, stakeholder engagement, major outcomes, ongoing challenges, and real-world application areas in the development of inclusive digital payment ecosystems.

Contributions from various models such as NGOs, micro-insurance startups and community-based organizations have contributed their unique perspectives and approaches to inclusive digital payment ecosystem building for financial inclusion (Ge et al., 2022; Wu et al., 2024). For example, digital financial inclusion enables integration of rural economies [1] (the use of savings in communities and merchants in peri-urban areas as ecosystem 'anchors' are typical). It has also been noted that multi-stakeholder partnerships help in developing ecosystems by aligning the activities of NGOs, micro-insurance providers, and local firms, as a way of addressing financial exclusion; promoting risk-sharing mechanism, and addressing local needs (Xue & Zhang, 2022; Chang et al., 2024). However, there are still issues such as the variable effect of impact across different territories, the lack of coordination in normative matters, and the requirement of flexible frameworks which can ensure sustainability and resilience of ecosystems. While there have been important strides, the literature acknowledges a lack of both comparing frameworks and empirical measures of how integrative strategies create value to all involved actors, which implies a need for more systematic frameworks that identify pathways of synergy and scale for digital payment ecosystems (Tian et al., 2024).

Digital Financial Ecosystems

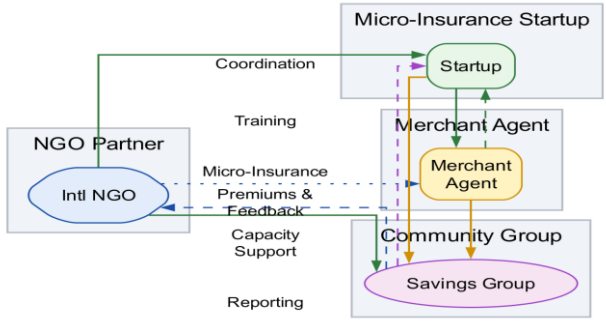

Figure 2. Conceptual diagram illustrating the core components and interactions within a typical digital financial ecosystem, highlighting the roles of NGO partners, startups, merchant agents, and community groups as synthesized from the literature. This figure clarifies how digital financial services architectures are structured and where key actors interface.

This figure (2) presents an integrated schematic of digital financial ecosystem structure and actor interactions.

Digital financial ecosystems Digital financial ecosystems are intricate assemblages of actors including NGOs, micro-insurance start-ups, merchant agents, and community groups, which collectively design inclusive financial architectures for low income or peri-urban communities. These ecosystems are based on a combination of technological innovation, policy incentives and participatory mechanisms to break down access, risk-sharing, and resource allocation barriers (Ge et al., 2022; Xue & Zhang, 2022). Their successes depend on strong linkages and site-specific strategies that promote the use of technology, encourage modernization of agriculture, and build resilience by engaging numerous interested parties in decision making process (Chang et al., 2024; Wu et al., 2024).

Multi-Stakeholder Partnerships and Micro-Insurance

Table 2. Stakeholder Roles and Contributions in Digital Payment Ecosystems

Stakeholder Group	*Primary Roles*	*Key Contributions*	*Challenges*	*Example Initiatives*

NGOs	Facilitate inclusion, provide training, advocate policy	Mobilize community savings groups, drive outreach	Sustainability, scaling, regulatory barriers	Digital literacy programs, policy advocacy
Micro-Insurance Startups	Develop financial products, innovate risk management	Design and distribute micro-insurance, create digital solutions	Trust building, low margins, distribution reach	Weather-index crop insurance, digital agri-insurance
Community Groups	Aggregate demand, enable peer support, savings	Manage local savings, promote adoption, network effects	Resource limitations, exclusion risks	Village savings and loan associations
Peri-Urban Merchants	Last-mile payment acceptance, extend market access	Promote digital transactions, pilot new services	Interoperability, affordability, digital literacy	Mobile money onboarding, acceptance pilot schemes

This table (2) details the primary roles, contributions, challenges, and example initiatives of key stakeholders in inclusive digital payment ecosystems, specifically focusing on NGOs, micro-insurance startups, community groups, and peri-urban merchants.

Second, collaboration involving multiple actors has been the key to building inclusive digital payment ecosystems, as illustrated by the roles of NGOs and micro-insurance start-ups, as well as the activities of community networks and peri-urban merchants which each complement the work of others in complex ways. Key drivers' Digital financial inclusion is community mobilisation of savings groups; design of community-based micro-insurance products for risk sharing; and skills development for peri-urban traders. They foster reductions in financial inclusion gaps through trust development, lowering transaction costs and providing tailored financial services that meet the needs of the underserved (Ge et al., 2022; Xue & Zhang, 2022; Wu et al., 2024).

Conceptual Framework

This proposal is grounded on the conceptual mapping and integrative ecosystem modelling, for generating a systematic characterization of functional roles, value exchanges, and governance arrangements that comes into play for inclusive digital payment ecosystems. At the core of this solution is the formation of multi-sector partnerships that link INGOs, micro-insurance start-ups, community savings groups and merchant agents, allowing for bundling and expanded delivery of micro-insurance and digital payments in peri-urban areas. This allows the authors to classify actors' relationships, resource-sharing mechanisms and prototypical operational forms offering a panorama about the practices of trust generation, risk reduction and the integration and coordination on the basis of evidence from the literature of digital financial inclusion and participatory development (Keith et al., 2022; Valladares-Castellanos et al., 2023; Sors et al., 2022). By showing the interplay of power dynamics, coordination challenges and sustainability risks, the conceptual map offers practitioners and policy-makers a 'thinking tool' to design, replicate and scale stakeholder-driven digital financial ecosystems.

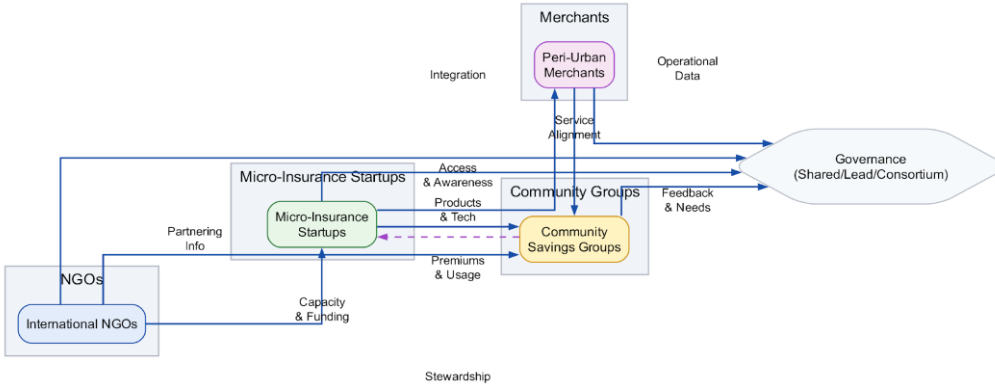

Figure 3. Overview of multisector partnership framework

This figure (3) provides a visual synthesis of the conceptual model, mapping the core actors, their roles, value flows, and key governance linkages in inclusive digital payment ecosystem design.

Actor Roles and Value Exchanges

Inclusive digital payment ecosystems, as depicted by the essential actors such as NGOs, micro-insurance start-ups, community savings groups and peri-urban merchants relate to one another in predefined roles through value transfers, which underline ecosystem growth. These may be framed at two levels: NGOs are often focused on activation of local, community-based resilience (sub-market activation),

multi-stakeholder collaboration and micro-insurance startups are framed as risk protection service (digital innovation). Community-led savings groups create shared financial behaviours which will drive financial inclusion and long-term resilience and peri-urban vendors increase access to payments, increase uptake of digital and stimulate local economies. This relationship is based on robust DFS frameworks, formal partnership agreements and adaptable value propositions to motivate all actors to participate and contribute resources (Ge et al., 2022; Perrone et al., 2023; Sors et al., 2023).

Table 3. Actor Types and Value Exchange Mechanisms in Inclusive Payment Ecosystems

Actor	*Primary Role*	*Value Provided*	*Value Received*	*Interaction Focus*
NGOs	Enable inclusion, foster capacity	Training, advocacy, partnerships	Community data, social legitimacy	Mobilization, partnership facilitation
Micro-Insurance Startups	Innovate financial protection	Risk-pooling products, tech solutions	Market access, user data	Product adoption, claim management
Community Savings Groups	Aggregate savings, support peers	Savings networks, adoption momentum	Financial tools, supporting tech	Peer support, group lending
Peri-Urban Merchants	Facilitate transactions, educate users	Local access, awareness outreach	Expanded customer base, tech integration	Transaction facilitation, onboarding
Payment Service Providers	Enable infrastructure, interoperability	Digital payment rails, APIs	Transaction volume, network expansion	Integration, scaling
Local Governments	Regulate, convene actors	Policy frameworks, regulatory clarity	Stakeholder insight, operational data	Oversight, policy guidance

This table (3) compares the primary roles, value provided, value received, and key interaction domains of major actors within inclusive digital payment ecosystems.

Governance Structures and Taxonomy of Relationships

The success of governance in inclusive digital payment ecosystems is dependent on international NGOs, micro-insurance startups, community savings groups, and peri-urban merchants, independently generating complementary, albeit different roles. These players deliberately craft their partnerships around decentralized models of network-based mutual accountability, shared decision-making, and resource sharing, all in consideration of their need to create sustainable ecosystems and strong financial inclusion (Muir et al., 2023; Perrone et al., 2023). For example, fundamental governance structures generally take the form of lead-actor, consortium-based, distributed, or platform-centric, that in combination form the "taxonomy of relationships" concerning, among others, authority, data stewardship, and incentive mechanisms in digital ecosystems (Papari et al., 2024). According to Jennings et al. (2024), the dimensions of governance model also concerned are: formalisation of functions; compliance with regulatory norms; transparency; and adaptive strategy, all of major relevance to address the multi-dimensionality of the demands of peri-urban actors and so to build up ecosystem resilience.

Table 4. Governance Models and Relationship Taxonomy in Digital Payment Ecosystems

Model Type	*Lead Actor(s)*	*Relationship Structure*	*Key Governance Features*	*Strengths*	*Typical Use Cases*
Lead-Actor	NGOs or Startups	Hierarchical, centralized	Clear roles, top-down oversight	Accountability, efficiency	Policy pilots, early-stage rollouts
Consortium-Based	NGOs, Startups, Merchants	Collaborative, multi-lead	Shared decision rights, joint standards	Risk sharing, collective bargaining	Large-scale inclusion drives
Distributed	Community Groups, Merchants	Networked, peer-to-peer	Adaptive roles, decentralization	Local legitimacy, flexibility	Savings networks, micro-lending

Platform-Centric	Payment Service Providers	Integrated hub-spoke	Rule-based protocols, interoperability	Scalability, resource pooling	Merchant onboarding, real-time payments

This table (4) presents a taxonomy of key governance models, principal actors, relationship structures, governance characteristics, strengths, and prominent application areas found in inclusive digital payment ecosystems.

Methodology

This paper deployed a two-phased methodological approach comprising of conceptual mapping and integrative ecosystem modelling, to explore inclusivity threads in digital payment ecosystems enabled by NGOs, micro-insurance startups and community groups. During the process of conceptual mappings, high-order relationships, resource flows and actor links constructed through literature and synopsis being used actors' role scope arrangements in low-income contexts were de-identified (Keith et al., 2022; Bezerra et al., 2022). Subsequent integrative modelling condensed these mappings into a system level architecture, indicating how to govern organizational capacity, value flow and partnership structures for scale-up. The key methodological steps comprised a) the entailment and typification of the stakeholder roles, b) key information and resource flows; c) the depiction of coalition- level operational interactions, and d) the integration of these into an iteratively testable model that can be used to perform scenario testing and scrutinize for further empirical support (Vollmer et al., 2022; Giang et al., 2024).

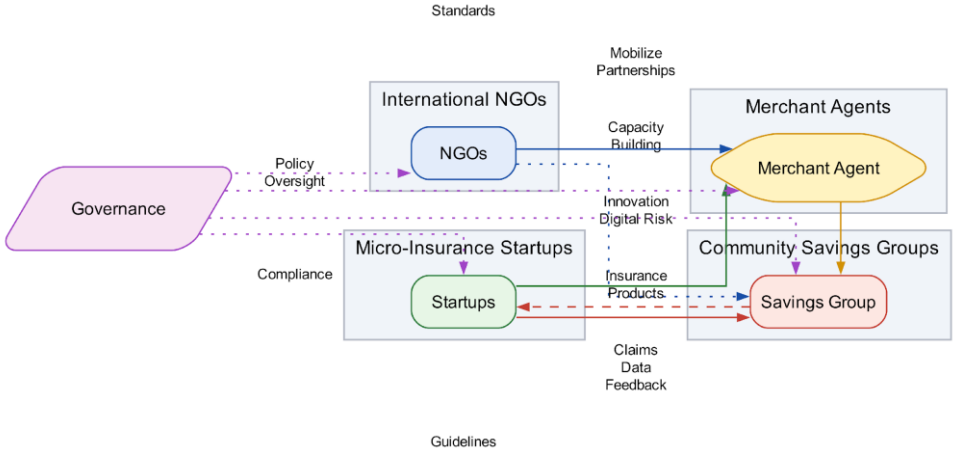

Figure 4. Figure illustrating the conceptual framework for multisector partnerships integrating NGOs, micro-insurance startups, and community savings groups in digital payment ecosystems for low-income settings. The diagram visually maps actor roles, resource flows, and operational interactions to clarify the integrative modelling methodology discussed in this section.

This figure (4) visualizes the integrative conceptual framework for mapping multisector partnerships in digital payment ecosystems, specifying the interconnectedness of NGOs, micro-insurance startups, and community savings groups.

Results and Analysis

In our analysis we reveal trends concerning five basic indicators and speak about the promising future, but also the dangers, due to the existing partnership ecosystems. The findings show a high level of operational partnership structure coherence in terms of clear governance layers and stakeholder alignment for operational blend integration. Conceptual clarity in role taxonomy facilitated iterative actor coordination, was influential but only context-specific in terms of policy translatability, with specifics varying and most influential in those frameworks with mechanisms that were more pliable for adaptation (Perrone et al., 2023; Ly & Cope, 2023). Towards replicability A framework was developed for formalizing the knowledge transfer and adaptation processes between partner sites.

Table 5. Summary Comparison of Ecosystem Evaluation Metrics

Metric	*Definition*	*Observed Strengths*	*Observed Limitations*	*Implications*
Partnership Structure Coherence	Degree of alignment and operational clarity among partner entities	Strong governance, clear stakeholder roles	Potential rigidity under rapid change	Facilitates reliable coordination
Ecosystem Scalability Potential	Capacity for expansion while maintaining effectiveness	Adaptive processes, scalable architecture	Resource-intensive, interoperability demands	Enables system growth across contexts
Role Taxonomy Clarity	Precision in actor role definitions	Improved coordination,	Complexity for multi-role actors	Streamlines implementation

	and responsibilities	fewer conflicts		
Policy Translation Relevance	Efficacy of policy frameworks in applicable contexts	Flexible adaptation, actionable guidelines	Variable effectiveness across locales	Supports policy-driven integration
Replicability Framework Robustness	Ability for solutions to be duplicated and adapted	Strong formalization, protocol standardization	Dependence on knowledge transfer mechanisms	Promotes cross-site learning

This table (5) summarizes the metric definitions, observed strengths and limitations, and practical implications for each core ecosystem evaluation metric analysed in the study.

$$Coherence\ Index = \frac{\sum_{i=1}^{n} w_i S_i}{\sum_{i=1}^{n} w_i} \#(1)$$

Equation (1) defines the coherence index as the weighted average of stakeholder coherence scores, supporting quantitative assessment of partnership alignment.

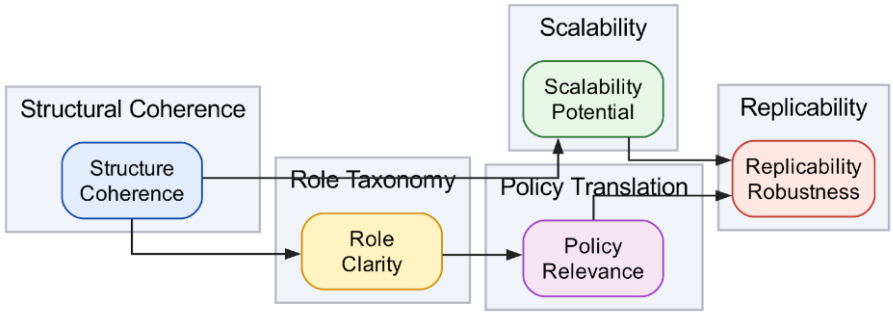

Figure 5. Overview of the key metrics used to evaluate partnership effectiveness and ecosystem integration across the case study. This visualization provides a conceptual mapping of metrics such as partnership structure coherence, scalability potential, and replicability framework robustness, positioned within the collaborative ecosystem context.

This figure (5) provides a visual summary of the principal metrics assessed in the

ecosystem partnership evaluation, facilitating interpretation of multidimensional integration and effectiveness.

Partnership Archetypes and Operational Integration

Ensuring that the partnership models and the integration mechanisms are well designed is critical to support inclusive, scalable, and sustainable digital payment ecosystems. Important areas of consideration are how the coherence of partnership structure, the potential to scale ecosystems, the clarity of the taxonomy of roles and applicability of the policy translation and the robustness of the replicability framework support or hinder functional integration-mindedness. Coherence implies the alignment and the clarity of operation between the entities; scalability depends on the adaptiveness of the processes and the modular nature of the architectures that allow their evolution without compromising the system reliability. Role taxonomy clarity contributes to conflict risk reduction and implementation performance. The extent to which policy programmes are translated into operational models of action territorializes the relevance of policy into different places. The required robustness of replicability frameworks is a foundation for knowledge transfer, protocol standardisation and adaptation across contexts, underpinning cross-site learning and more systemic impact (Keith et al., 2022; Valladares-Castellanos et al., 2024; Bezerra et al., 2022).

Table 6. Comparison of Partnership Metrics Across Archetypes

Archetype	*Structure Coherence*	*Scalability Potential*	*Role Taxonomy Clarity*	*Policy Translation Relevance*	*Replicability Framework Robustness*
Lead-Actor	High	Moderate	High	Moderate	Low
Consortium-Based	Moderate	High	Moderate	High	Moderate
Distributed	Moderate	Moderate	Moderate	Low	High
Platform-Centric	High	High	High	High	Moderate

This table (6) compares the degree of structure coherence, scalability, role taxonomy

clarity, policy relevance, and replicability robustness across four primary partnership archetypes found in inclusive digital payment ecosystems.

$$Scalability\ Index = \frac{Number\ of\ Supported\ Transactions}{Resource\ Units\ Consumed} \#(2)$$

Equation (2) defines an operational scalability index as the ratio of supported transactions to resource units consumed, enabling quantitative comparison of scalability potential between partnership models.

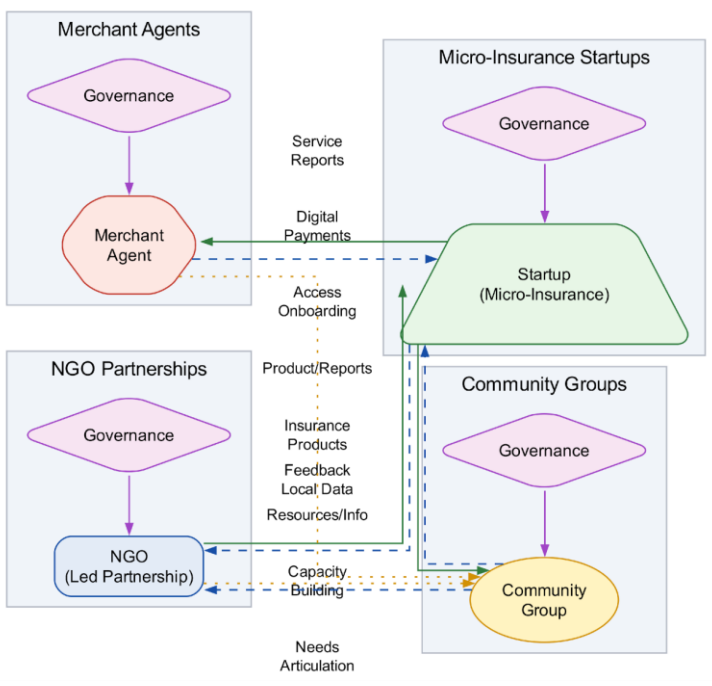

Figure 6. Diagrammatic taxonomy of partnership archetypes and operational integration models among NGOs, micro-insurance startups, and community groups. The figure maps functional roles and illustrates value exchanges and governance structures critical to scalable, inclusive digital payment ecosystems.

This figure (6) visually presents a taxonomy of partnership archetypes and associated integration models, clarifying the relationships and operational structures among principal ecosystem actors in inclusive digital payment initiatives.

Resource Sharing and Risk Mitigation Strategies

Resource sharing and risk reduction in NGO/micro-insurance startups and community collective in digital payment ecology is systematically shaped by coherence of the partnership structure, scalability potential within the ecosystem, clarity of the role taxonomy, relevance of policy translation, and the robustness of replicability framework. These include the need for clear governance to enable pooling of resources, scalable collaboration solutions, clear roles for actors in order to reduce operational ambiguity, alignment of guidelines with local practices, and formalised partnership protocols for replication of innovations across settings (Perrone et al., 2023; Bezerra et al., 2022; Sors et al., 2023).

Table 7. Metric Comparison for Resource Sharing and Risk Mitigation

Metric	*Definition*	*Significance for Resource Sharing*	*Significance for Risk Mitigation*	*Illustrative Example*
Partnership Structure Coherence	Degree of alignment among participating entities	Ensures transparent resource pooling and allocation	Reduces coordination failure and fraud risk	Clearly articulated governance agreements
Ecosystem Scalability Potential	Capacity to expand and integrate more actors efficiently	Facilitates scaling shared infrastructure and services	Maintains reliability as user base grows	Modular platforms supporting rapid onboarding
Role Taxonomy Clarity	Precision in defining stakeholder roles and duties	Supports targeted resource distribution	Prevents overlaps or responsibility gaps	Distinct onboarding procedures for NGOs vs. startups
Policy Translation Relevance	Applicability of policy frameworks in local contexts	Guides equitable resource access under varying conditions	Mitigates regulatory uncertainty and enables compliance	Locally adapted digital finance regulations
Replicability Framework Robustness	Extent to which processes can be duplicated elsewhere	Enables knowledge, tool, and protocol transfer	Supports continuity and resilience across locations	Standardized templates for partnership agreements

This table (7) compares the five-evaluation metrics, their definitions, and specific significance in the context of resource sharing and risk mitigation strategies among ecosystem partners.

Discussion

This research contributes to a nuanced theoretical lens for organizing multi-sectoral initiatives in inclusive digital payment ecosystems by making explicit how NGOs, micro-insurance start-ups, community groups, and merchant agent groups can conjoin effectively. Particularly useful are the categorizations of actor relationships and partnership types, both of which offer usable models of how coordinating the sharing of resources, operation and risk across network members might be managed, addressing head on the heterogeneity and complexity of the peri-urban (Valladares-Castellanos et al., 2024; Ge et al., 2022). There are, however, continuing dilemmas associated with managing power imbalances among stakeholder groups, avoiding the pitfalls of coordination and ensuring sustainability, especially where trust and common goals may be weak (Muir et al., 2023; Sors et al., 2023). The governance mechanisms of the framework ensure transparency and adaptability and the policy implications provide tailored suggestions for scaling and replication from the bottom up to facilitate participatory context-specific approaches (Heller et al., 2023). These results inform practitioners and policy-makers to develop resilient stakeholder-based models that can scale financial services sustainably.

Table 8. Major Pitfalls and Mitigating Strategies in Multisector Payment Partnerships

Pitfall	*Underlying Cause*	*Impact*	*Proposed Mitigation*
Power Differentials	Centralized resource control	Disempowerment of local actors	Shared decision protocols, capacity building
Coordination Failures	Fragmented objectives, weak communication	Operational inefficiency, duplicated effort	Joint planning processes, clear role definition
Sustainability Risks	Short-term funding, shifting priorities	Breakdown of partnerships, loss of trust	Diverse revenue streams, embedded feedback loops

Policy Misalignment	Rigid or top-down policy transfer	Regulatory non-compliance, local inadaptability	Iterative co-design, local policy adaptation
Technology Gaps	Limited digital literacy, infrastructure gaps	Barriers to access and adoption	Targeted capacity training, context-driven solutions

This table (8) presents five critical pitfalls in multisector payment ecosystem partnerships, analyses the root cause and impact of each, and details tailored strategies for mitigation as synthesized from the conceptual framework.

Policy Implications and Replicability

There are policy drivers in the integrated digital payment eco system. The model of governance is driven by the type of partnership cohesiveness and stakeholders involved, and the eco-system potential reflects the scalability of the system for scaling by users. Definition OROH Satisfies Coordination The actor taxonomy is the higher the coordination is (less additional actors). The significance of policy translation, to adapt frameworks to locally appropriate conditions, is emphasised, if policy-making is to be effective in regulation. This replicability framework is a powerful method leading to a sustainable expansion of the ecosystem with new setting of models and protocols (Papari et al., 2024; Keith et al., 2022; Peskett et al., 2023). All of this together informs policies and adaptive responses.

Table 9. Policy Significance and Replicability Impact of Core Metrics

Metric	*Policy Significance*	*Replicability Impact*
Partnership Structure Coherence	Defines clear operational roles and alignment	Enables transfer of governance models
Ecosystem Scalability Potential	Guides resource planning for expansion	Ensures adaptability to new contexts
Role Taxonomy Clarity	Improves stakeholder integration	Simplifies onboarding in new settings
Policy Translation Relevance	Facilitates adjustment to local regulations	Enables context-driven policy adaptation
Replicability Framework Robustness	Standardizes templates and protocols	Promotes cross-site learning and adoption

This table (9) compares the policy significance and replicability impact of each core evaluation metric within inclusive digital payment ecosystems.

Conclusion

The framework contributes an understanding of inclusive digital payment ecosystems, as it identifies the complex dynamics of international NGOs, micro-insurance startups, and community savings groups and emphasizes the merchant agent as key enabler in peri-urban areas. Through the provision of a taxonomy of actor relationships, resource and risk sharing typologies and governance forms the paper details the means by which mutual trust and coordination are developed. Research, practice and policy relevance include the importance of formalized collaborations and networks, requirement to engage in integrative governance and the requirement to tailor best practices to local contexts. The main limitations of the model are centered on the theoretical nature of the proposed framework, which stresses the need for empirical validation and context-dependent refinement in subsequent research endeavours.

References

Ge H.; Li B.; Tang D.; Xu H.; Boamah V. (2022). Research on Digital Inclusive Finance Promoting the Integration of Rural Three-Industry. *International Journal of Environmental Research and Public Health*, 19(6). DOI: 10.3390/ijerph19063363.

Muir A.M.; Bernhardt J.R.; Boucher N.W.; Cvitanovic C.; Dettmers J.M.; Gaden M.; Hinderer J.L.M.; Locke B.; Robinson K.F.; Siefkes M.J.; Young N.; Cooke S.J. (2023). Confronting a post-pandemic new-normal—threats and opportunities to trust-based relationships in natural resource science and management. *Journal of Environmental Management*, 330. DOI: 10.1016/j.jenvman.2022.117140.

Valladares-Castellanos M.; de Jesús Crespo R.; Xu Y.J.; Douthat T.H. (2024). A framework for validating watershed ecosystem service models in the United States using long-term water quality data: Applications with the InVEST Nutrient Delivery (NDR) model in Puerto Rico. *Science of the Total Environment*, 949. DOI: 10.1016/j.scitotenv.2024.175111.

Cobian K.P.; Hurtado S.; Romero A.L.; Gutzwa J.A. (2024). Enacting inclusive science: Culturally responsive higher education practices in science, technology, engineering, mathematics, and medicine (STEMM). *PLoS ONE*, 19(1 JANUARY). DOI: 10.1371/journal.pone.0293953.

Jennings V.; Rigolon A.; Thompson J.; Murray A.; Henderson A.; Gragg R.S. (2024). The Dynamic Relationship between Social Cohesion and Urban Green Space in Diverse Communities: Opportunities and Challenges to Public Health. *International Journal of Environmental Research and Public Health*, 21(6). DOI: 10.3390/ijerph21060800.

Chopra R.; Rehman M.A.; Yadav A.; Bhardwaj S. (2024). Revisiting the EKC framework concerning COP-28 carbon neutrality management: Evidence from Top-5 carbon embittering countries. *Journal of Environmental Management*, 356. DOI: 10.1016/j.jenvman.2024.120690.

Keith D.A.; Ferrer-Paris J.R.; Nicholson E.; Bishop M.J.; Polidoro B.A.; Ramirez-Llodra E.; Tozer M.G.; Nel J.L.; Mac Nally R.; Gregr E.J.; Watermeyer K.E.; Essl F.; Faber-Langendoen D.; Franklin J.; Lehmann C.E.R.; Etter A.; Roux D.J.; Stark J.S.; Rowland J.A.; Brummitt N.A.; Fernandez-Arcaya U.C.; Suthers I.M.; Wiser S.K.; Donohue I.; Jackson L.J.; Pennington R.T.; Iliffe T.M.; Gerovasileiou V.; Giller P.; Robson B.J.; Pettorelli N.; Andrade A.; Lindgaard A.; Tahvanainen T.; Terauds A.; Chadwick M.A.; Murray N.J.; Moat J.; Pliscoff P.; Zager I.; Kingsford R.T. (2022). A function-based typology for Earth's ecosystems. *Nature*, 610(7932), pp. 513. DOI: 10.1038/s41586-022-05318-4.

Sakdapolrak P.; Sterly H.; Borderon M.; Bunchuay-Peth S.; Naruchaikusol S.; Ober K.; Porst L.; Rockenbauch T. (2024). Translocal social resilience dimensions of migration as adaptation to environmental change. *Proceedings of the National Academy of Sciences of the United States of America*, 121(3). DOI: 10.1073/pnas.2206185120.

Chang K.; Luo D.; Dong Y.; Xiong C. (2024). The impact of green finance policy on green innovation performance: Evidence from Chinese heavily polluting enterprises. *Journal of Environmental Management*, 352. DOI: 10.1016/j.jenvman.2023.119961.

Fenta A.A.; Tsunekawa A.; Haregeweyn N.; Tsubo M.; Yasuda H.; Kawai T.; Berihun M.L.; Ebabu K.; Sultan D.; Mekuriaw S. (2023). An integrated framework for improving watershed management planning. *Environmental Research*, 236. DOI: 10.1016/j.envres.2023.116872.

Xue L.; Zhang X. (2022). Can Digital Financial Inclusion Promote Green Innovation in Heavily Polluting Companies?. *International Journal of Environmental Research and Public Health*, 19(12). DOI: 10.3390/ijerph19127323.

Wolff J.L.; DesRoches C.M.; Amjad H.; Burgdorf J.G.; Caffrey M.; Fabius C.D.; Gleason K.T.; Green A.R.; Lin C.-T.; Nothelle S.K.; Peereboom D.; Powell D.S.; Riffin C.A.; Lum H.D. (2023). Catalyzing dementia care through the learning health system and consumer health information technology. *Alzheimer's and Dementia*, 19(5), pp. 2197. DOI: 10.1002/alz.12918.

Louis D.N.; Perry A.; Wesseling P.; Brat D.J.; Cree I.A.; Figarella-Branger D.; Hawkins C.; Ng H.K.; Pfister S.M.; Reifenberger G.; Soffietti R.; Von Deimling A.; Ellison D.W. (2021). The 2021 WHO classification of tumors of the central nervous system: A summary. *Neuro-Oncology*, 23(8), pp. 1231. DOI: 10.1093/neuonc/noab106.

Perrone D.; Rohde M.M.; Hammond Wagner C.; Anderson R.; Arthur S.; Atume N.; Brown M.; Esaki-Kua L.; Gonzalez Fernandez M.; Garvey K.A.; Heidel K.; Jones W.D.; Khosrowshahi Asl S.; Munill C.; Nelson R.; Ortiz-Partida J.P.; Remson E.J. (2023). Stakeholder integration predicts better outcomes from groundwater sustainability policy. *Nature Communications*, 14(1). DOI: 10.1038/s41467-023-39363-y.

Schwartz G.L.; Leifheit K.M.; Arcaya M.C.; Keene D. (2024). Eviction as a community health exposure. *Social Science and Medicine*, 340. DOI: 10.1016/j.socscimed.2023.116496.

Vollmer D.; Burkhard K.; Adem Esmail B.; Guerrero P.; Nagabhatla N. (2022). Incorporating Ecosystem Services into Water Resources Management—Tools, Policies, Promising Pathways. *Environmental Management*, 69(4), pp. 627. DOI: 10.1007/s00267-022-01640-9.

Xiao H.; Bao S.; Ren J.; Xu Z.; Xue S.; Liu J. (2024). Global transboundary synergies and trade-offs among Sustainable Development Goals from an integrated sustainability perspective. *Nature Communications*, 15(1). DOI: 10.1038/s41467-023-44679-w.

Slattery M.; Dunn J.; Kendall A. (2024). Charting the electric vehicle battery reuse and recycling network in North America. *Waste Management*, 174, pp. 76. DOI: 10.1016/j.wasman.2023.11.018.

Hjort J.; Seijmonsbergen A.C.; Kemppinen J.; Tukiainen H.; Maliniemi T.; Gordon J.E.; Alahuhta J.; Gray M. (2024). Towards a taxonomy of geodiversity. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 382(2269). DOI: 10.1098/rsta.2023.0060.

Rossi C.; Byrne J.G.; Christiaen C. (2024). Breaking the ESG rating divergence: An open geospatial framework for environmental scores. *Journal of Environmental Management*, 349. DOI: 10.1016/j.jenvman.2023.119477.

Heller J.C.; Little O.M.; Faust V.; Tran P.; Givens M.L.; Ayers J.; Farhang L. (2023). Theory in Action: Public Health and Community Power Building for Health Equity. *Journal of Public Health Management and Practice*, 29(1), pp. 33. DOI: 10.1097/PHH.0000000000001681.

Lee R.; White C.J.; Adnan M.S.G.; Douglas J.; Mahecha M.D.; O'Loughlin F.E.; Patelli E.; Ramos A.M.; Roberts M.J.; Martius O.; Tubaldi E.; van den Hurk B.; Ward P.J.; Zscheischler J. (2024). Reclassifying historical disasters: From single to multi-hazards. *Science of the Total Environment*, 912. DOI: 10.1016/j.scitotenv.2023.169120.

Ly A.M.; Cope M.R. (2023). New Conceptual Model of Social Sustainability: Review from Past Concepts and Ideas. *International Journal of Environmental Research and Public Health*, 20(7). DOI: 10.3390/ijerph20075350.

Ai X.; Zheng X.; Zhang Y.; Liu Y.; Ou X.; Xia C.; Liu L. (2024). Climate and land use changes impact the trajectories of ecosystem service bundles in an urban agglomeration: Intricate interaction trends and driver identification under SSP-RCP scenarios. *Science of the Total Environment*, 944. DOI: 10.1016/j.scitotenv.2024.173828.

Bezerra M.O.; Vollmer D.; Acero N.; Marques M.C.; Restrepo D.; Mendoza E.; Coutinho B.; Encomenderos I.; Zuluaga L.; Rodríguez O.; Shaad K.; Hauck S.; González R.; Hernandéz F.; Montelongo R.; Torres E.; Serrano L. (2022). Operationalizing Integrated Water Resource Management in Latin America: Insights from Application of the Freshwater Health Index. *Environmental Management*, 69(4), pp. 815. DOI: 10.1007/s00267-021-01446-1.

Wu T.; Wen L.; Yi M. (2024). Balancing growth targets and environmental regulations: An empirical analysis of dual policy impact on corporate environmental responsibility–insights from China. *Journal of Environmental Management*, 355. DOI: 10.1016/j.jenvman.2024.120500.

Giang A.; Edwards M.R.; Fletcher S.M.; Gardner-Frolick R.; Gryba R.; Mathias J.-D.; Venier-Cambron C.; Anderies J.M.; Berglund E.; Carley S.; Erickson J.S.; Grubert E.; Hadjimichael A.; Hill J.; Mayfield E.; Nock D.; Pikok K.K.; Saari R.K.; Lezcano M.S.; Siddiqi A.; Skerker J.B.; Tessum C.W. (2024). Equity and modeling in sustainability science: Examples and opportunities throughout the process. *Proceedings of the National Academy of Sciences of the United States of America*, 121(13). DOI: 10.1073/pnas.2215688121.

Tanir T.; Yildirim E.; Ferreira C.M.; Demir I. (2024). Social vulnerability and climate risk assessment for agricultural communities in the United States. *Science of the Total Environment*, 908. DOI: 10.1016/j.scitotenv.2023.168346.

Sors T.G.; O'Brien R.C.; Scanlon M.L.; Bermel L.Y.; Chikowe I.; Gardner A.; Kiplagat J.; Lieberman M.; Moe S.M.; Morales-Soto N.; Nyandiko W.M.; Plater D.; Rono B.C.; Tierney W.M.; Vreeman R.C.; Wiehe S.E.; Wools-Kaloustian K.; Litzelman D.K. (2023). Reciprocal innovation: A new approach to equitable and mutually beneficial global health partnerships. *Global Public Health*, 18(1). DOI: 10.1080/17441692.2022.2102202.

Wu S.; Cheng P.; Yang F. (2024). Study on the impact of digital transformation on green competitive advantage: The role of green innovation and government regulation. *PLoS ONE*, 19(8 August). DOI: 10.1371/journal.pone.0306603.

Šakić Trogrlić R.; Reiter K.; Ciurean R.L.; Gottardo S.; Torresan S.; Daloz A.S.; Ma L.; Padrón Fumero N.; Tatman S.; Hochrainer-Stigler S.; de Ruiter M.C.; Schlumberger J.; Harris R.; Garcia-Gonzalez S.; García-Vaquero M.; Arévalo T.L.F.; Hernandez-Martin R.; Mendoza-Jimenez J.; Ferrario D.M.; Geurts D.; Stuparu D.; Tiggeloven T.; Duncan M.J.; Ward P.J. (2024). Challenges in assessing and managing multi-hazard risks: A European stakeholders perspective. *Environmental Science and Policy*, 157. DOI: 10.1016/j.envsci.2024.103774.

De Foo C.; Verma M.; Tan S.Y.; Hamer J.; van der Mark N.; Pholpark A.; Hanvoravongchai P.; Cheh P.L.J.; Marthias T.; Mahendradhata Y.; Putri L.P.; Hafidz F.; Giang K.B.; Khuc T.H.H.; Van Minh H.; Wu S.; Caamal-Olvera C.G.; Orive G.; Wang H.; Nachuk S.; Lim J.; de Oliveira Cruz V.; Yates R.; Legido-Quigley H. (2023). Health financing policies during the COVID-19 pandemic and implications for universal health care: a case study of 15 countries. *The Lancet Global Health*, 11(12), pp. e1964. DOI: 10.1016/S2214-109X(23)00448-5.

Tian Z.; Qiu L.; Wang L. (2024). Drivers and influencers of blockchain and cloud-based business sustainability accounting in China: Enhancing practices and promoting adoption. *PLoS ONE*, 19(1 January). DOI: 10.1371/journal.pone.0295802.

Opabola E.A.; Galasso C. (2024). Informing disaster-risk management policies for education infrastructure using scenario-based recovery analyses. *Nature Communications*, 15(1). DOI: 10.1038/s41467-023-42407-y.

Guillaume D.; Waheed D.-E.-N.; Schleiff M.; Muralidharan K.K.; Vorsters A.; Limaye R.J. (2024). Global perspectives of determinants influencing HPV vaccine introduction and scale-up in low- and middle-income countries. *PLoS ONE*, 19(1 January). DOI: 10.1371/journal.pone.0291990.

Papari C.-A.; Toxopeus H.; Polzin F.; Bulkeley H.; Menguzzo E.V. (2024). Can the EU taxonomy for sustainable activities help upscale investments into urban nature-based solutions?. *Environmental Science and Policy*, 151. DOI: 10.1016/j.envsci.2023.103598.

Ahmad M.; Ahmed Z.; Alvarado R.; Hussain N.; Khan S.A. (2024). Financial development, resource richness, eco-innovation, and sustainable development: Does geopolitical risk matter?. *Journal of Environmental Management*, 351. DOI: 10.1016/j.jenvman.2023.119824.

Wilson D.C. (2023). Learning from the past to plan for the future: An historical review of the evolution of waste and resource management 1970–2020 and reflections on priorities 2020–2030 – The perspective of an involved witness. *Waste Management and Research*, 41(12), pp. 1754. DOI: 10.1177/0734242X231178025.

Bernays S.; Lanyon C.; Tumwesige E.; Aswiime A.; Ngwenya N.; Dlamini V.; Shahmanesh M.; Seeley J. (2023). 'This is what is going to help me': Developing a co-designed and theoretically informed harm reduction intervention for mobile youth in South Africa and Uganda. *Global Public Health*, 18(1). DOI: 10.1080/17441692.2021.1953105.

Peskett L.; Metzger M.J.; Blackstock K. (2023). Regional scale integrated land use planning to meet multiple objectives: Good in theory but challenging in practice. *Environmental Science and Policy*, 147, pp. 292. DOI: 10.1016/j.envsci.2023.06.022.