

CASHLESS SOCIETY AND THE INFORMAL ECONOMY: ASSESSING THE POTENTIAL OF POLICY-DRIVEN DIGITAL PAYMENT ECOSYSTEMS FOR SUSTAINABLE TRANSFORMATION

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Abstract: *This study maps the intellectual, thematic, and geographic structure of research on cashless society programmes and digital payment adoption within the informal economy, addressing the fragmented state of this literature between 2010 and 2025. A bibliometric analysis was conducted using performance indicators and science mapping techniques (via VOSviewer) applied to 97 peer-reviewed Scopus articles, following a structured Boolean search and PRISMA-based screening protocol. Publication output grew markedly after 2023, coinciding with post-pandemic digital financial inclusion agendas. Four thematic clusters were identified: financial inclusion and empowerment, technology adoption, informal entrepreneurship, and financial literacy and well-being. The field is transitioning from individual-level adoption studies toward ecosystem-level and capacity-building perspectives, though it remains anchored in the Technology Acceptance Model and Technology-Organisation-Environment framework. Cashless programmes function as key policy*

instruments for building digital ecosystems within the informal economy, though gaps in policy coherence and long-term sustainability remain evident. This study is among the first to apply a Theory-Context-Characteristics-Methods synthesis to the intersection of policy-driven cashless programmes and informal business adoption, offering an integrative research agenda distinct from broader fintech or financial-inclusion bibliometric reviews.

Keywords: *bibliometric analysis, cashless society, digital payments, informal business, VOSviewer, developing economies*

Introduction

Digital transformation, widespread smartphone use, and the proliferation of financial technology in recent years have led to the emergence of cashless economies. In Malaysia, policies to create a non-cash society and promote financial inclusion using digital financial services (Economic Planning Unit, 2021) are presented through the Malaysia Digital Economy Blueprint (MyDIGITAL) and cashless society programmes.

While these initiatives have the potential to reduce economic vulnerability, informal businesses encompassing street vendors and micro-entrepreneurs continue to be overlooked in discourse about digitalisation (Peña et al., 2024). These entrepreneurs struggle with issues involving technological constraints, poor digital literacy (Islam & Hasan, Shahedul Fahim, 2024), lack of trust in electronic payments (Kamis et al., 2025), and inadequate infrastructure (Andaregie et al., 2025). In Indonesia, security, social influence, and trust play important roles in encouraging QRIS technology adoption. Existing studies appear to be fragmented without integrative approaches.

Despite extensive studies on cashless programmes and informal businesses, they continue to be under-mapped, with limited research integrating publications on digital payment into a structured landscape. The present study addressed this limitation via bibliometric analysis to map the ways in which cashless society programmes, digital transactions, and informal business adoption were examined between 2010-2025. Using the keywords 'co-occurrence and visual science mapping', publication trends, most cited works, top countries, concept clusters, and research hotspots were analysed using the primary data derived from Scopus.

It is important to distinguish this focus from adjacent bibliometric reviews already available in the literature. Existing bibliometric mappings of financial technology (e.g., Tepe and Geyikci, 2021) treat digital financial innovation as a broad, undifferentiated field spanning blockchain, cryptocurrency, insurtech, and regtech alongside payment systems, while bibliometric reviews of financial inclusion predominantly examine formal-sector banking access rather than the specific dynamics of cashless-policy implementation among informal-economy actors. The present study narrows the bibliometric lens specifically to the intersection of policy-driven cashless society programmes and informal business adoption, a segment of the literature that, despite its practical relevance to financial inclusion policy in developing economies, has not previously been systematically mapped in isolation from the broader fintech or financial-inclusion literature. This targeted intersection constitutes the primary contribution of the present study. Four research questions guide this study:

RQ1: What are the publication trends and citation patterns from 2010 to 2025?

RQ2: Which countries and authors are most influential?

RQ3: Which themes dominate highly cited studies?

RQ4: What emerging research clusters can be identified?

The abovementioned questions allow for delineating the development of cashless society programmes and digital transaction systems in informal business ecosystems amidst digital transformation. The elicited outcomes may serve as a framework of reference for scholars, policymakers, digital finance practitioners, and other agents striving toward financial inclusion. This article is organised as follows: Section 2 denotes the bibliometric methodology and steps undertaken to select relevant publications; Section 3 highlights both the empirical and analytical outcomes; Section 4 presents the outcome interpretation in relation to past studies; and Section 5 concludes with theoretical and practical implications, as well as directions for future work.

Methodology

This bibliometric study adopted a quantitative, descriptive, and exploratory research design. From a methodological point of view, two primary components underpin the framework. First, a bibliometric analysis was performed to map the intellectual, conceptual, and thematic structure of empirical works on cashless society programmes and digital transactions in informal businesses. Second, the procedures applied to retrieve, screen, and pre-process data were outlined together with the implementation of analytical tools for generating performance indicators and science-mapping visualisations (Tepe & Geyikci, 2021).

Bibliometric Analysis

In this bibliometric analysis, quantitative indicators and science mapping techniques were implemented to assess the research output, impact, and thematic evolution. Publication trends were evaluated to gauge patterns of growth, whilst geographic contributions identified leading countries. Citation analysis denoted the influential studies that have added depth to the discourse. To guide the synthesis and interpretation of the mapped literature, this study additionally adopted the Theory-Context-Characteristics-Methods (TCCM) framework (Paul and Rosado-Serrano, 2019), which structures the discussion of findings according to the theoretical foundations, contextual boundaries, study characteristics, and methodological trends observed across the reviewed publications. Keyword co-occurrence analysis was performed with author keywords and indexed terms to ascertain the research directions. To identify the thematic clusters and conceptual links in relevant works, VOSviewer was used to create network visualisations.

Procedural Analysis

The main data source was Scopus, which offers a broad spectrum of disciplines. A structured Boolean search was conducted with the following keywords: "cashless", "digital payment", "mobile payment", "e-wallet", "QR payment", "DuitNow", as well as "street vendor", "micro trade", and "informal business" (sectoral terms). The search was limited to journal articles published in the English language from 2010-2025. Data were extracted on 28 November 2025 for consistency and reproducibility. Metadata such as article titles, abstracts, authors, keywords, and citation counts were exported in CSV format to facilitate analysis. The data were mapped with VOSviewer (version 1.6.20) (Jan & Ludo, 2010). The selection protocol and inclusion boundaries are illustrated in Figure 1.

Scope of Inclusion and Screening Strategy

To guarantee the consistency of the final dataset with the research objectives, PRISMA-based identification and screening were implemented (see Figure 1) to confirm relevance and consistency. This empirical work analysed the adoption of digital payments, financial inclusion, behavioural frameworks, and policy-driven cashless transformations in informal businesses. Of the initial 376 papers, 279 were omitted for being irrelevant, thus yielding a final dataset of 97.

Results

This section highlights the bibliometric analysis outcomes in line with the research questions. The focus is on publication trajectories within a specific timeframe, top countries that support cashless society programmes and digital transactions, highly cited publications and their thematic orientations, and key research hotspots derived from keyword co-occurrence and overlay mapping. The targeted, visually supported interpretation in each subsection details the development of studies related to cashless systems, digital payments, and informal business adoption from 2010 to 2025.

Publication Trends and Growth Patterns (RQ1)

Based on Figure 2, the research on digital payments and informal businesses or micro-traders has been developed in a structured manner. There has been a shift from an extended formative period to one of accelerated development. The earliest research first appeared in 2012, denoting a rise in scholarly interest. Yet, there was little progress from 2013 to 2018. The interplay between these systems and informal economy players is less examined, despite ongoing developments in digital payment systems. Hence, this domain lacks integration and the empirical momentum for further development.

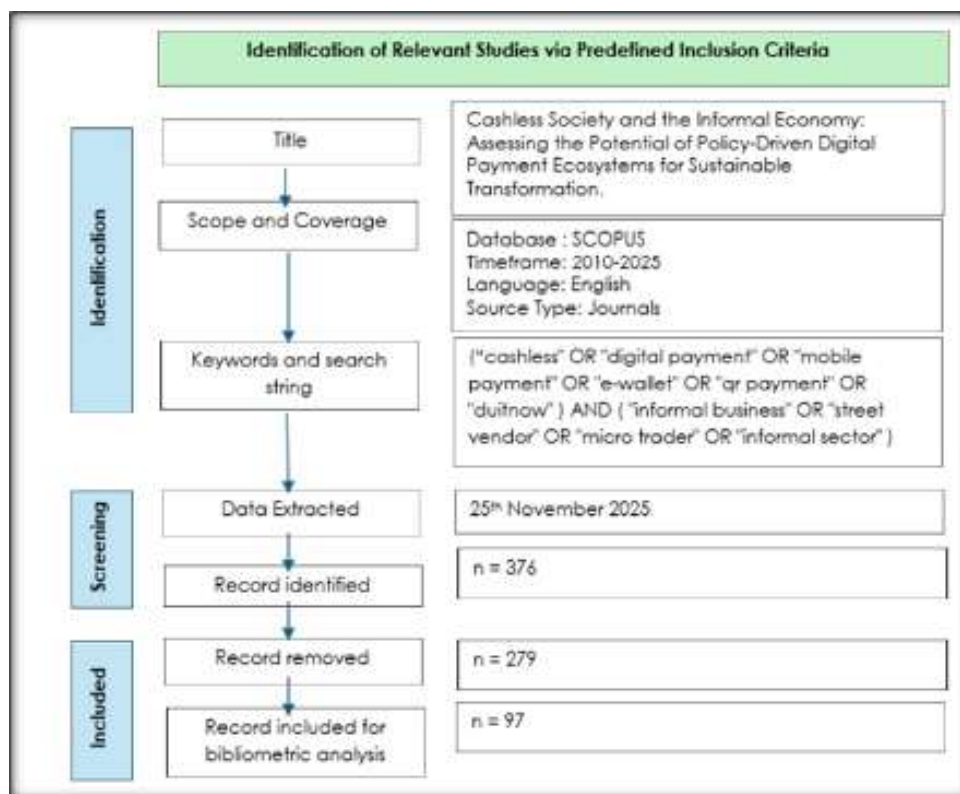


Figure 1: PRISMA-guided Identification and Screening Procedure

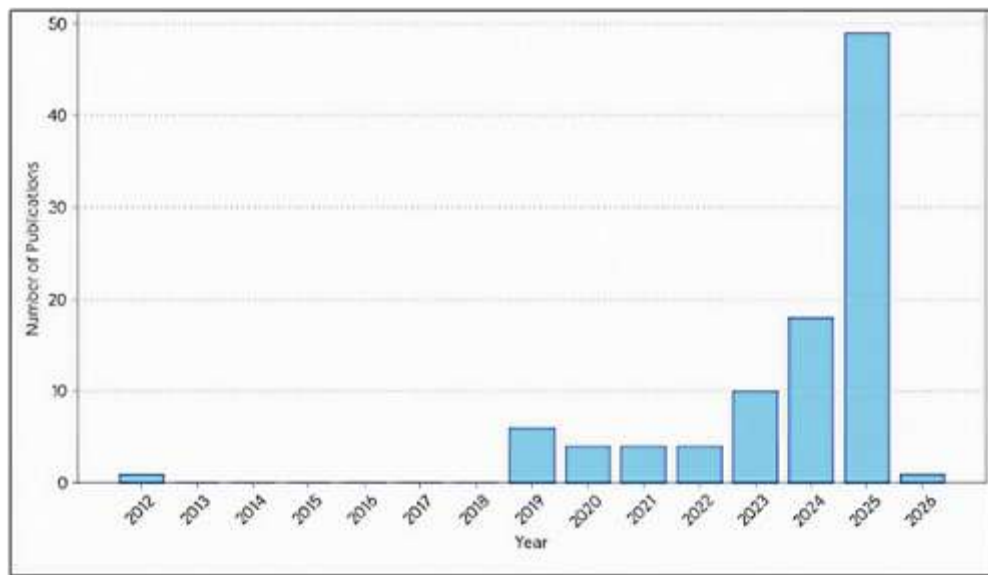


Figure 2: Total Publications

With an increase in annual publications to six, a more structured phase began in 2019. Between 2020 and 2022, the number of papers stabilised at about four publications per year. There was no decline in research outputs, despite the unforeseen emergence of COVID-19. The research area has thus begun capturing academic interest. As of 2022, the cumulative number of 19 papers implies that consolidation is not rapid but occurs more gradually. It is at this validation stage that the basic framework and empirical context are refined.

The phase of exponential growth begun in 2023. Annual publications rose from 10 to 18 in 2023 and 2024, respectively. A drastic increase in studies to 49 was highlighted in 2025. With a growth rate of 172%, the increase in publications between 2024-2025 was the highest identified in the dataset. The level of academic interest was gauged through the number of studies in 2025, which accounts for a significant proportion of the total articles. The cumulative growth pattern follows a typical S-shaped curve, with the initial lag giving way to rapid acceleration after achieving a critical threshold. From 2019-2025, the compound annual growth rate (CAGR) stood at 41.8%, implying the entry of a phase informed by high growth and visibility.

Global Contributions and Geographic Distribution (RQ2)

A significant increase was observed in digital payment adoption among informal businesses (see Figure 3), with 81% of the studies published from 2023 to 2025. In particular, the publication of 49 articles in 2025 showed an increase in research. This shift signals the global importance of digital finance and the digital transformation after the pandemic.

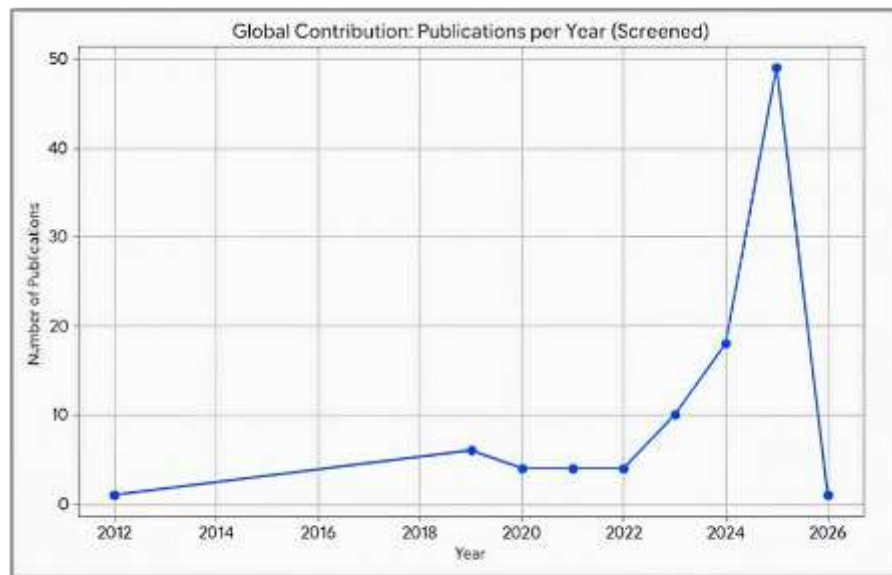


Figure 3: Global Contribution: Publications per Year

Geographically, the studies were strongly clustered around the Global South (see Figure 4). India emerged as the top country with 12 articles. Sub-Saharan Africa (Ghana, Ethiopia, Nigeria, Kenya, and Rwanda) emerged as another primary cluster. Southeast Asia (Indonesia, Vietnam, and Malaysia) also witnessed exponential growth. Despite more than half of the articles using a global or non-country-specific perspective, the findings were drawn from developing nations. The link between mobile payment systems and the informal business sector is important when discussing national economic development.

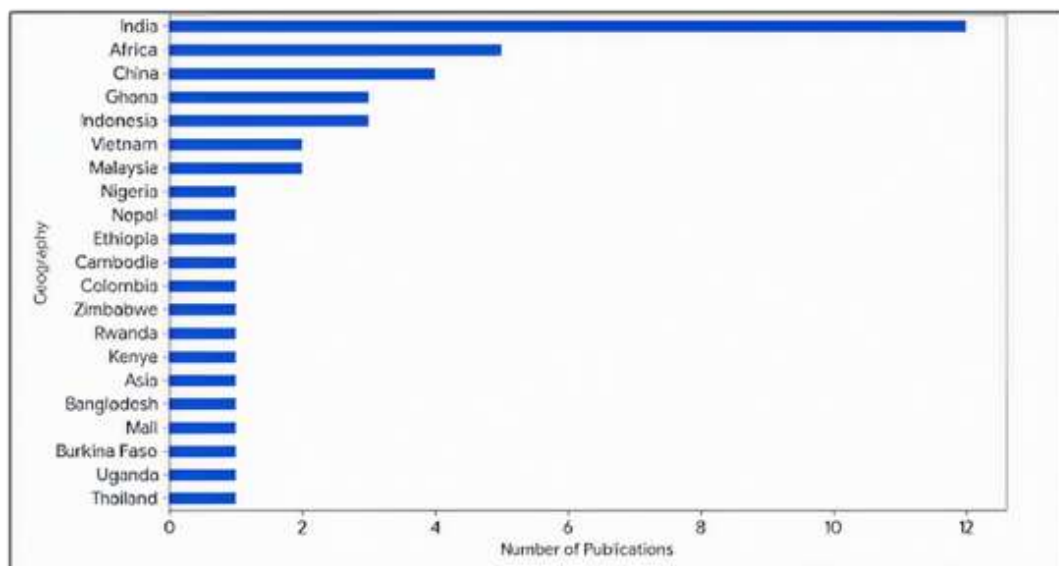


Figure 4: Geographic Distribution of Research

Most Cited Articles and Influential Themes (RQ3)

A cluster of highly-cited research informed studies examining digital payments in informal businesses. These high-impact publications heavily expounded on mobile payment use, financial inclusion, and the economic empowerment of less privileged entrepreneurs.

Uduji et al. (2019) and Mishra et al. (2022) studied the impact of e-wallets on informal farm entrepreneurship in Nigeria and mobile payment adoption among informal retailers in India, respectively, with 51 citations each (see Table 1). Pipitwanichakarn and Wongtada (2021) employed the technology acceptance model (TAM) in the micro-business adoption of mobile commerce, with 45 citations. Senyo et al.'s (2023) study on fintech-based empowerment, Rana et al.'s (2020) research on mobile payment adoption in Malaysia, and Asamoah et al.'s (2020) work on mobile money transfer capabilities and business development were additional contributions. Kamble et al. (2024) and Qatawneh et al.'s (2025) high-impact research pointed to a salient focus on digital financial literacy and long-term usage intentions.

Four thematic areas (see Table 2) were derived from the analysis of keyword frequency and citation intensity. Financial inclusion and economic development were initially identified as the main themes. It was reported in highly cited studies that e-wallets and mobile money systems are pivotal tools for including unbanked populations into the formal financial system, in which the digital adoption process is associated with empowerment and wider development outcomes. This indicates a structural, development-based focus in the selected articles. Second, informal sector adoption behaviour and intention constitute a substantial research stream. An extensive number of influential studies used frameworks such as TAM and technology-organisation-environment to elucidate adoption decisions among street vendors, micro-entrepreneurs, and informal retailers. Hence, this signals the research area's continued relevance to well-grounded theories of technology implementation.

Third, bottom-of-the-pyramid actors and micro-entrepreneurs have been extensively examined in the selected papers, especially street vendors (Thailand), rural farmers (Nigeria), and small-scale retailers (India and Malaysia). This illustrates their socioeconomic vulnerability and the catalytic impact of adopting digital payments.

Table 1: Most Cited Articles

Rank	Authors	Title	Year	Citations
1	Uduji et al. (2019)	The impact of e-wallets on informal farm entrepreneurship development in rural Nigeria	2019	51
2	Mishra et al. (2022)	Merchants' adoption of mobile payment in emerging economies: the case of unorganised retailers in India	2022	51
3	Pipitwanichakarn and Wongtada (2021)	Leveraging the technology acceptance model for mobile commerce adoption under distinct stages of adoption: A case of micro businesses	2019	45
4	Senyo et al. (2023)	Moving away from trading on the margins: Economic empowerment of informal businesses through FinTech	2023	39
5	Rana et al. (2020)	Moving from bricks to clicks: Merchants' acceptance of the mobile payment in Malaysia	2020	39

Rank	Authors	Title	Year	Citations
6	Pipitwanichakarn and Wongtada (2019)	Mobile commerce adoption among the bottom of the pyramid: a case of street vendors in Thailand	2019	38
7	Qatawneh et al. (2025)	Exploring the antecedent factors of continuous intention to use mobile money: insights from emerging markets	2025	38
8	Kamble et al. (2024)	Financial Inclusion and Digital Financial Literacy: Do they Matter for Financial Well-being?	2024	36
9	Panetta et al. (2022)	The development of digital payments – Past, present, and future – From the literature	2023	35
10	Asamoah et al. (2020)	Examining the effect of mobile money transfer (MMT) capabilities on business growth and development impact	2020	34

Table 2: Dominant Strand Emerges from Keywords Frequency and Citation Prominence

Theme	Core Focus	Key Concepts / Frameworks	Target Context	Research Orientation
Financial Inclusion & Economic Development	Digital payments as tools for economic empowerment and inclusion	E-wallets, Mobile money, Inclusion, Development, Empowerment	Previously unbanked populations; informal sector participants	Development-oriented; structural empowerment perspective
Adoption Behavior & Intention	Determinants of digital payment adoption decisions	Technology Acceptance Model (TAM), TOE framework, Behavioral intention, Usage	Street vendors, micro-entrepreneurs, and unorganized retailers	Technology adoption paradigm; theory-driven
Bottom-of-the-Pyramid & Micro-Entrepreneurs	Socioeconomic transformation among vulnerable economic actors	Informal economy, Microbusinesses, Women entrepreneurs, Street vendors	Thailand, Nigeria, India, Malaysia (emerging markets)	Context-specific empirical focus; socioeconomic vulnerability lens
Digital Financial Literacy & Well-being	Impact of digital knowledge on long-term financial outcomes	Digital literacy, financial well-being, and behavioral capability	Informal users of digital finance tools	Emerging capability-based and sustainability-oriented perspective

Lastly, digital financial literacy and financial well-being were identified as an emerging theme. The recent increase in most cited studies, published from 2024-2025, highlighted a transition from examining adoption to how digital knowledge, literacy and behavioural capabilities impact long-term financial outcomes. In sum, the most frequently cited studies have

demonstrated a transition from adoption and financial inclusion to empowerment, capability building, and sustainability-driven financial well-being models. Figure 5 illustrates four dominant research strands in cashless adoption studies, highlighting their core focus, theoretical frameworks, target contexts, and research orientations based on keyword frequency and citation prominence.

Emerging Research Hotspots and Thematic Clusters (RQ4)

For improved analytical robustness and decreased semantic noise, a minimum occurrence threshold was applied to the full set of keywords elicited from all 97 papers. By retaining only words that met the predetermined frequency criteria for constructing networks, a refined set of terms that hold conceptual weight was used to capture the most prominent topics from 2012-2025.

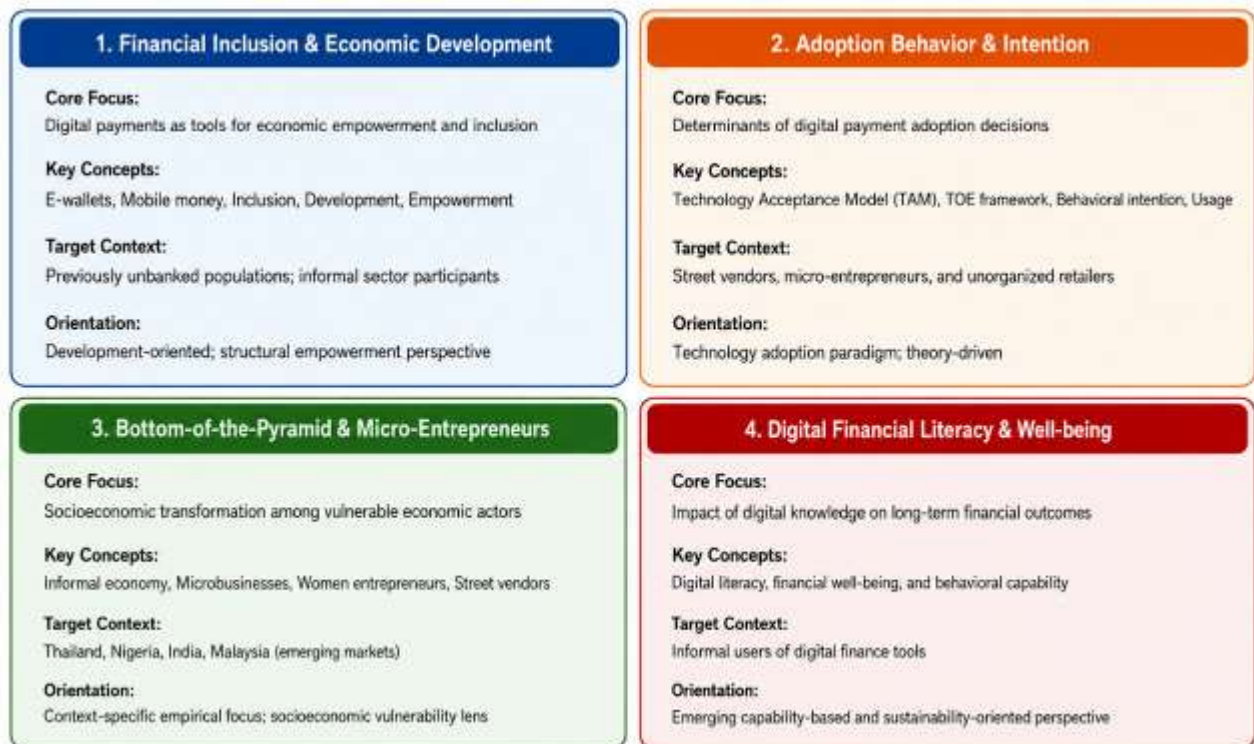


Figure 5: Dominant Research Strands in Cashless Adoption Studies

The co-occurrence network derived from this analysis was segmented into colour-coded clusters, with each one representing a key thematic area: financial inclusion and informal economy integration, technology adoption and behavioural intention, entrepreneurship and bottom-of-the-pyramid dynamics, digital economy and policy environments, and emerging themes of digital financial literacy and well-being. Based on the VOSviewer map, a multi-cluster intellectual structure with distinct yet interconnected research streams were created (Mpekiri & Papaspyropoulos, 2026). In Figure 6, the orange cluster (found in the middle) is underpinned by mobile payment, which functions as the key intellectual hub. Given its strong interrelations, mobile payment adoption connects multiple perspectives of technology, behaviour, and development.

The green cluster represents financial inclusion and the informal economy, with emphasis on empowerment and the incorporation of less privileged groups into formal financial systems.

Following its dense connections, inclusion is still a fundamental part of the selected publications. This is closely followed by the red cluster, which is associated with entrepreneurship and the shadow economy of informal entrepreneurs, microbusiness activities, and structural economic environments. The yellow cluster is concerned with adoption behaviour and theoretical modelling, one of which is TAM. This underscores the field's wide employment of technology acceptance paradigms to define behaviour-related determinants among micro-entrepreneurs and informal actors. The blue cluster represents macro-level dimensions of the digital economy, innovation, and regulatory environments. This indicates a shift to institutional and ecosystem-level analysis.

This purple cluster comprises themes of financial literacy, behaviour, and well-being. Despite being small, the cluster denotes how capability building and long-term financial outcomes are increasingly gaining ground. Based on the cluster structure, there is a shift from adoption- and inclusion-driven studies to theoretically driven works that consider the broader ecosystem, literacy, and sustainability-oriented models.

The temporal evolution of the field is depicted through the VOSviewer overlay visualisation, as shown in Figure 7. Previous works (blue-purple nodes) placed much emphasis on adoption frameworks and theory. Nonetheless, following advancements in research, green nodes indicate a shift to financial inclusion, informal sector integration, and entrepreneurship. Recent works (yellow nodes) point to financial literacy, well-being, as well as intention of usage, thus suggesting a shift to long-term impact and sustainability. Taken together, this development signals a change in perspective from explaining adoption of digital payment to assessing its socioeconomic significance and resilience in informal economic contexts.

Discussion

The findings indicate that research on digital payment adoption in informal economies has evolved from a niche adoption-focused field into a rapidly expanding and increasingly mature research domain. Publication growth, particularly since 2023, reflects stronger academic and policy attention toward digital transformation, financial inclusion, and fintech development in emerging economies. The geographic and citation patterns show a strong concentration in the Global South, where informal businesses remain central to economic and financial inclusion agendas. The intellectual structure continues to draw heavily on established adoption theories such as TAM and TOE, while recent studies increasingly emphasise empowerment, financial literacy, well-being, sustainability, and institutional factors. Collectively, these trends suggest a clear transition from explaining technology adoption toward evaluating its broader socioeconomic, developmental, and long-term impacts.

Publication Trends and Growth Patterns (RQ1)

The studies falling under this domain are gravitating toward institutionalisation, signalling a shift from exploratory work. The sudden surge since 2023 potentially reflects wider structural drivers, including digital transformation post-pandemic, increased policy focus on financial inclusion, and the proliferation of fintech ecosystems in developing nations. While the rise in 2025 may have been caused by the indexing effects or broader database coverage, the steady growth indicates mainstream academic recognition. There is a clear progression from a niche research area to one that is mature and competitive, as demonstrated by the publication trends.

Global Contributions and Geographic Distribution (RQ2)

Some of the studies focusing on digital payment adoption in informal economies emerged from a "niche" subject to one that is publicly visible and rapidly growing between 2023-2025. This reflects a growing academic interest and strong policy relevance to digital transformation after the pandemic.

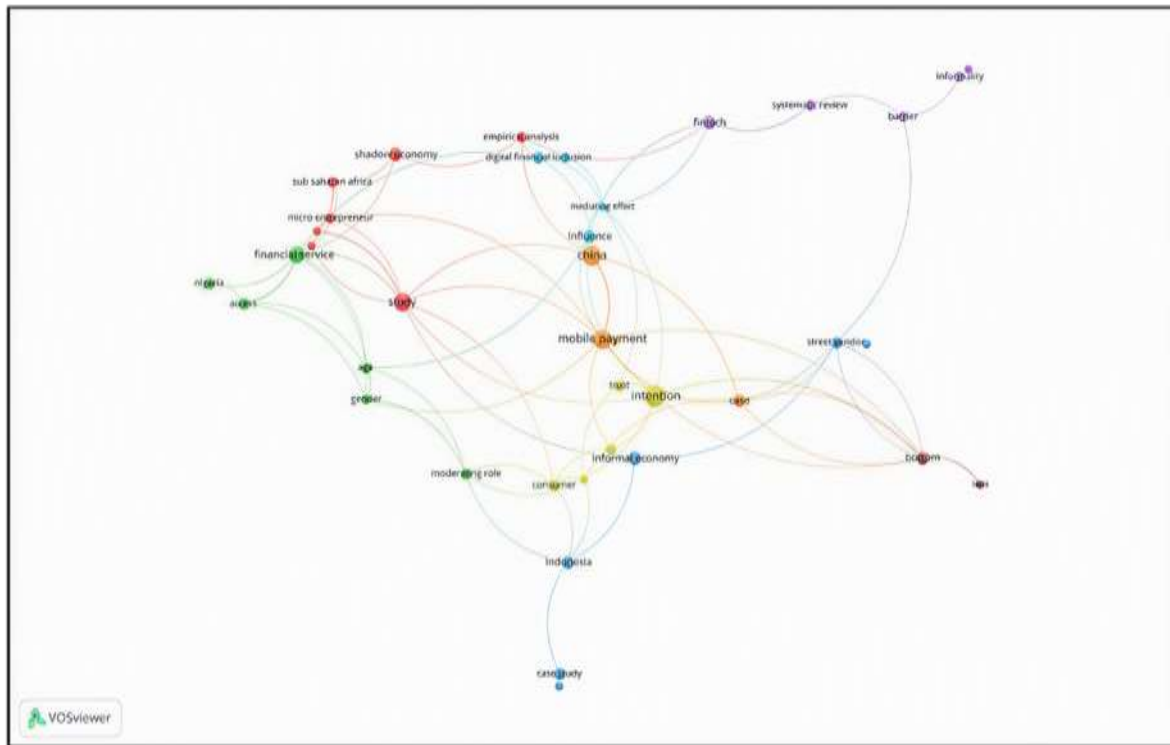


Figure 6: Network Visualisation Based on Cluster

The articles used in this study were geographically specific to the Global South, providing a suitable context for understanding sizeable informal sectors and ever-evolving fintech. Most of the studies were still context-specific, but a large number has broadened their view to include cross-contextual perspectives. The shift away from case studies is indicative of theoretical maturation. This could be attributed to the interdisciplinary and complex nature of the field, which is shaped by technology policy, development economics, entrepreneurship, and information systems. However, such a geographic concentration highlights the need for extensive comparative and longitudinal studies to reinforce conceptual rigour and the generalisability of outcomes.

Most Cited Articles and Influential Themes (RQ3)

The citation structure of the screened dataset demonstrated a holistic intellectual foundation underpinned by adoption, inclusion, and empowerment. Highly cited works have generated statistical significance and informed the theoretical trajectory of the field. With 51 citations, Uduji et al. (2019) and Mishra et al. (2022) prioritised digital payment technologies in relation to informal sector transformation, which can boost rural farm entrepreneurship in Nigeria and merchant adoption among informal retailers in India. These findings are reflective of developing nations, which constitute a sizeable and dynamic informal business sector.

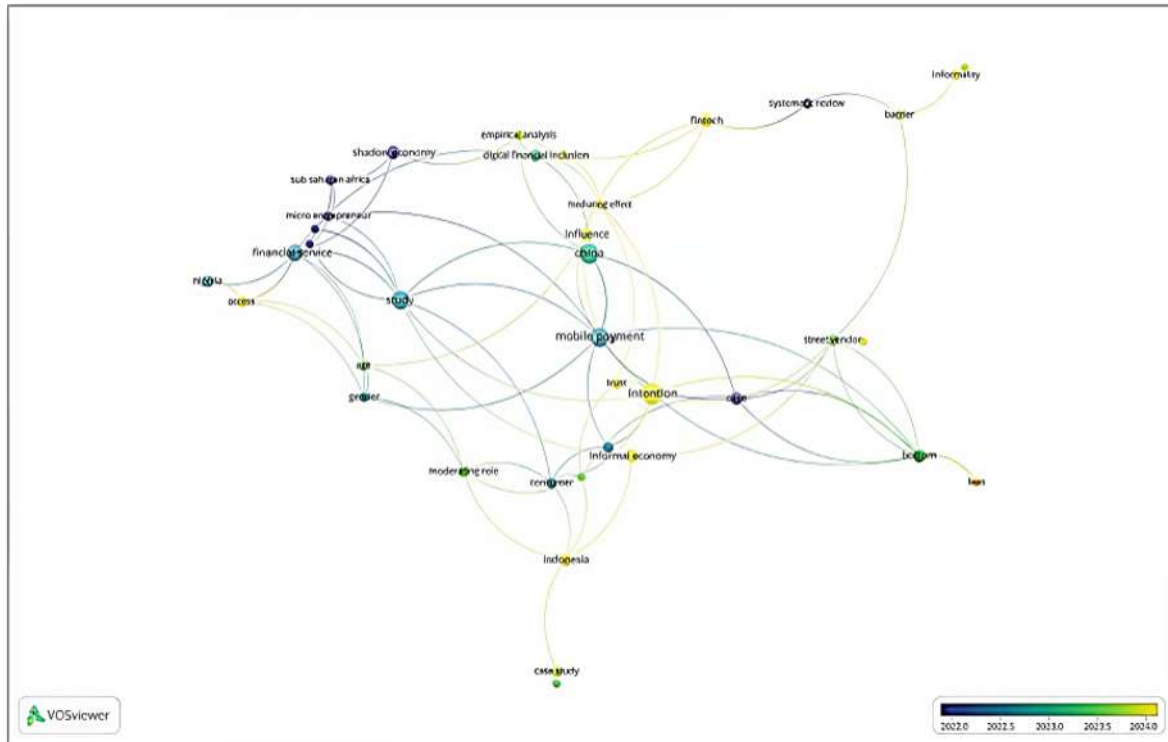


Figure 7: Overlay Visualisation

Given the high citation performance of TAM-based studies, the field remains rooted in well-grounded adoption models (Pipitwanichakarn & Wongtada, 2019). Both TAM and TOE are capable of systematically delineating behavioural intention and use. However, their dominant trend seems to favour conceptual dependence, which may limit theoretical diversification if not extended to ecosystem-level or institutional perspectives. Thematically, the selected studies primarily focused on financial inclusion and economic development, as digital payments are deemed crucial for empowering marginalised groups. This is directly associated with the bottom-of-the-pyramid actors, which make informal business ecosystems both vulnerable and transformative. Recent high-impact research has emphasised a shift from adoption metrics to digital financial literacy and long-term financial well-being, denoting a move from transactional acceptance to capacity building and sustainability.

The high-impact publications examined in this study demonstrated a shift from descriptive analyses of adoption to a broader focus on empowerment and financial well-being. Hence, potential scholars could leverage this transition to increase theoretical depth and policy relevance by merging behavioural, institutional, and capability-oriented perspectives.

Emerging Research Hotspots and Thematic Clusters (RQ4)

The keyword co-occurrence analysis demonstrated a coherent yet dynamic knowledge domain (Lan & Yan, 2026). For analytical robustness, a minimum occurrence threshold was applied to all 97 studies to remove peripheral terms and retain conceptually dominant ones. In line with the multi-cluster structure, empirical works on the adoption of digital payments in informal business ecosystems are not fragmented or monolithic, but rather underpinned by interrelated, thematic streams. The integrative role of mobile payment established its centrality as the key intellectual hub that connects TAM to broader issues of socioeconomic development (Muthusamy et al., 2024). Complementary views are apparent in surrounding clusters: the integration of financial inclusion and informal economy is key to strengthening a development-

based narrative; themes of entrepreneurship and shadow economy further enrich the structural-economic perspectives; and adoption behaviour grounded in TAM frameworks reflects theoretical continuity.

While the advent of macro-level digital economy and policy discourse pointed to institutional expansion, the smaller yet expanding cluster on financial literacy and well-being highlighted the move to capability building and long-term outcomes. The overlay visualisation also established a temporal transition from early adoption and theory-driven studies to recent studies on impact, sustainability, and resilience. In conclusion, the field is transitioning from explanation of adoption to assessment of greater socioeconomic change.

TCCM-Based Synthesis and Integrative Research Agenda

Beyond addressing RQ1-RQ4 individually, the preceding findings are synthesised here using the Theory-Context-Characteristics-Methods (TCCM) framework (Paul and Rosado-Serrano, 2019), a protocol widely applied in bibliometric and systematic reviews within the business and finance literature. This synthesis is intended to move the discussion beyond description of trends toward an integrative agenda for future theory-building, empirical design, and policy-relevant research.

Theoretically, the intellectual structure of this domain remains predominantly anchored in individual-level technology adoption theories, particularly the Technology Acceptance Model (TAM) and the Technology-Organisation-Environment (TOE) framework, as reflected in the citation weight of Pipitwanichakarn and Wongtada (2019, 2021) and Muthusamy et al. (2024). While these theories offer robust explanatory power for behavioural intention, their continued dominance signals a theoretical bottleneck: the field has yet to substantially incorporate institutional theory, ecosystem or platform theory, or capability-based frameworks that could explain adoption beyond the individual decision-maker.

Contextually, the reviewed literature is heavily concentrated in the Global South, namely India, Sub-Saharan Africa, and Southeast Asia, where informal economies constitute a substantial share of economic activity. This geographic clustering is conceptually appropriate but empirically limiting, as cross-country comparative designs bridging Global South contexts with policy-mature markets remain rare.

In terms of characteristics, the unit and level of analysis across the most-cited studies (Table 1) is overwhelmingly firm or individual-level, targeting micro-entrepreneurs, street vendors, and unorganised retailers, with limited attention to ecosystem-level or policy-level units of analysis such as platform providers, regulators, or financial institutions. This characteristic profile reinforces the adoption-centric orientation identified under RQ3 and helps explain why ecosystem-level and sustainability-oriented themes (Table 2) remain comparatively underdeveloped despite their emergence in 2024-2025.

Methodologically, the field is dominated by cross-sectional, perception-based quantitative designs, predominantly employing PLS-SEM or regression-based tests of TAM/TOE constructs. Longitudinal, mixed-method, or policy-impact evaluation designs remain rare despite their necessity for establishing developmental or causal claims about digital ecosystem transformation over time.

Table 3: TCCM-Based Synthesis and Integrative Research Agenda

TCCM Dimension	Current Trend (This Study's Findings)	Gap / Proposed Agenda
Theory	TAM and TOE dominate highly-cited studies	Institutional- and ecosystem-level frameworks; capability-based view
Context	Concentrated in the Global South (India, Sub-Saharan Africa, Southeast Asia)	Cross-regional comparative designs, including policy-mature markets
Characteristics	Individual/firm-level unit of analysis (street vendors, micro-entrepreneurs)	Ecosystem actors, policymakers, payment infrastructure providers
Methods	Cross-sectional surveys, PLS-SEM/regression	Longitudinal designs, policy impact evaluation, mixed methods

Table 3 consolidates these four dimensions into a forward-looking agenda: extending theory beyond TAM/TOE toward institutional and ecosystem-level frameworks; pursuing comparative, multi-region contextual designs; shifting the unit of analysis toward ecosystem actors and policy instruments; and adopting longitudinal and mixed-method designs capable of evaluating policy impact over time rather than adoption intention at a single point.

Conclusion and Recommendations

The study presented a systematic bibliometric mapping of cashless society programmes and digital transaction adoption in informal business ecosystems for the period of 2010-2025. Based on the elicited outcomes, the move from fragmented, exploratory research to a more integrated, application-focused area (especially after 2023) stemmed from rapid digitalisation, robust fintech infrastructure, and policy-driven financial inclusion measures in developing nations. The knowledge base was underpinned by mobile payment systems and key themes of financial inclusion, behavioural adoption, bottom-of-the-pyramid entrepreneurship, and digital financial literacy. Recent works have highlighted a move from the analysis of adoption to system capability, operational resilience, and user-level effectiveness.

In this context, the selected studies focused on emerging nations (India, Sub-Saharan Africa, and Southeast Asia), where informal businesses significantly shape their economic activity. According to citation and keyword patterns, practical implementation issues of usability, trust, infrastructure readiness, and system accessibility have begun gaining ground, despite the continued relevance of adoption frameworks. Evidently, there is a harmonisation of academic research and the deployment issues in real-life.

This study enriches the growing body of evidence through a macro-level synthesis of the intellectual, social, and conceptual structure, with empirical works on cashless society situated within the wider discourse of development and policy. Theoretically, the elicited outcomes call for a shift from single-theory dominance (TAM/UTAUT) to comprehensive models that blend behavioural, institutional, and socio-technical perspectives. Methodologically, there is a significant need to employ longitudinal designs, mixed-method approaches, and policy impact evaluations to capture the effectiveness of actual programmes over time, given the over-dependence on cross-sectional, perception-based studies.

In terms of industry and implementation, cashless ecosystems require a well-balanced system design with reliable digital infrastructure, interoperable payment platforms, user-friendly interfaces, and targeted capacity development initiatives for informal businesses. On practical grounds, limitations related to digital literacy, connectivity, and trust adversely impact utilisation. Comprehensive interventions entailing technology providers, financial institutions, and regulatory authorities are integral for addressing these issues to promote system reliability, scalability, and inclusiveness.

The current work provided a sound understanding of the structural evolution and practical direction of the field, which could serve as a guideline for future implementation-oriented research. However, contextual depth may be supported by bibliometric approaches and a single database. Potential scholars should focus on the empirical validation, pilot implementation, and performance assessment of cashless systems in informal businesses. To ensure that digital payment systems deliver observable benefits in real-world scenarios, it is imperative to focus more on process optimisation, user experience, and quantifiable economic outcomes.

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Declaration of competing interests

The authors declare no competing financial or personal interests.

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

During the preparation of this work, the authors used generative AI tools to assist with drafting, literature scanning, and figure preparation. After using these tools, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication. All substantive claims and citations were reviewed and verified by the authors, and the intellectual contribution, including the construct, its dimensions, and the propositions, is the authors' own.

CRedit authorship contribution statement

Rohaiza Kamis: Conceptualization, Methodology, Writing - original draft, Writing - review and editing, Supervision. Hairul Nizwan Abd Majid: Conceptualization, Validation, Writing - review and editing. Hazalinda Harun: Validation, Writing - review and editing. Mohd Isham Abidin: Validation, Writing - review and editing. Mohd Halim Mahphoth: Validation, Writing - review and editing. Amizatul Hawariah Awang: Validation, Writing - review and editing. Shafinar Ismail: Validation, Writing - review and editing.

Data availability

No data were used for the research described in this article.

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