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RESEARCH ARTICLE

PAYMENT FAILURES AND REVENUE DISRUPTION: ASSESSING THE RELIABILITY GAP IN UPI ADOPTION AMONG INDIA'S INFORMAL VENDORS

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Abstract

Existing research on India's Unified Payments Interface (UPI) has largely measured success through adoption, transaction volumes, and financial inclusion, treating uptake as evidence the system works. For informal vendors, running on thin margins and immediate liquidity needs, whether a payment can be depended on matters as much as whether it was accepted, a dimension that remains underexplored. This study examines how UPI payment failures affect vendors' daily operations and liquidity, based on fieldwork with 55 vendors in Mira-Bhayander Market, interviewed in Hindi and Marathi, alongside a survey of 56 customers. The findings identify six recurring sources of reliability failure: liquidity access, supply-chain timing, institutional friction, technical unfamiliarity, fraud-driven loss, and settlement costs. These findings show that vendors' capacity to use UPI is distinct from their preference for it, as many continue to rely on UPI despite preferring cash, reflecting accommodation rather than endorsement. A further asymmetry emerges between vendors and customers: vendors accommodate customers' preference for digital payments, while customers carry backup cash and switch methods when failures occur, indicating that the risks of payment disruptions are distributed unevenly rather than falling disproportionately on vendors. Adoption statistics record whether a vendor accepts UPI, but not who bears the consequences of a delayed, disputed, or fraudulent payment. The reliability gap identified here appears not as a temporary technical shortfall but as an informal redistribution of risk onto those least able to absorb it. The study concludes with policy directions, including transparent payment status.

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Introduction:-

The development of the Unified Payments Interface (UPI) is a significant milestone in India's financial history. In 2016, India's banking system relied on a fragmented network of IFSC codes and lengthy processing times for even a small daily payment. To address this, an organisation called NPCI built UPI, a system that concealed complicated bank data behind a simple identifier, such as a name and number. It went live shortly before the 2016 cash shortage, quickly turning smartphones into digital payment tools. UPI volumes grew from 131.1 billion transactions in 2023-24 to 185.8 billion transactions in 2024-25. This represents a 41.7% increase in volume. In terms of value, it marked

a 30.3% increase. (RBI, 2025) Following this shift, the RBI introduced the Payments Vision 2025 framework (RBI, 2022), which prioritises financial inclusion for small businesses, such as street vendors. These vendors form an often-overlooked part of the urban supply chain, aligning with the Ministry of Housing and Urban Affairs' launch of the Pradhan Mantri Street Vendor's AtmaNirbhar Nidhi (PM SVANidhi). It is a micro-credit facility through which the government offers small, collateral-free loans to help vendors buy inventory, repair their carts, and rebuild their livelihoods. However, while vendors benefit from these schemes, it remains unclear whether participation improves their economic well-being or exposes them to new operational difficulties, such as frozen screens and failed transactions that can result in losses.

While NPCI's aggregate data suggests a near-flawless system, with Technical Declines consistently below 1%, this aggregate figure may not hold uniformly across all settings. Congestion in crowded markets and busy roadside areas could plausibly be associated with higher localised decline rates, though this has not been established at the vendor level. Because most roadside purchases are small micro-payments under ₹500, even a modest rate of technical failure could translate into a meaningful volume of lost sales if customers are unwilling to wait or retry a transaction. For a street vendor operating on thin margins, the loss of even a few customers a day to a failed transaction could plausibly represent a significant share of daily take-home profit, though the actual scale of this effect for informal vendors has not been empirically documented, a gap this study addresses through fieldwork in Mira-Bhayander Market. This is compounded by Chargeback (CB) errors, in which a customer is debited without the vendor receiving confirmation, leaving vendors to either absorb the financial loss or navigate a burdensome dispute process that further strains their daily working capital.

The World Bank's Global Findex 2022 microdata indicates that low-income adults in India report higher rates of failed digital transactions than their higher-income counterparts, but does not disaggregate findings by occupation or trace economic consequences at the business level (Demirgüç-Kunt et al., 2022). To address this gap, this study employs a mixed-methods approach, combining primary survey data from informal vendors in Mira-Bhayander Market with secondary analysis of NPCI transaction data, RBI Payment System Reports, and World Bank Findex microdata. This issue extends beyond Mumbai or India and carries global implications. With approximately 90% of India's workforce operating informally (ILO, 2024), reliable payments are especially important for workers whose earnings and access to funds may depend on daily transactions. Adoption figures show whether a vendor accepts UPI, but not whether that vendor can depend on timely, usable funds. If success is measured only by the number of digital accounts opened rather than by payment reliability in everyday use, there is a risk of exporting a flawed model alongside the technology itself.

Objectives:-

Primary Objective:-

To examine how UPI payment failures affect the day-to-day operational and liquidity conditions of informal vendors in Mira-Bhayander Market, and how these experiences shape their continued reliance on the system.

Secondary Objectives:-

1. To identify the factors contributing to vendors' difficulties in relying on UPI, including liquidity access, supply-chain timing, institutional friction, technical unfamiliarity, fraud-driven loss, and settlement costs.
2. To assess whether continued use of UPI reflects genuine payment preference or a more constrained form of accommodation, and to distinguish vendors' ability to use UPI from their preference for using it.
3. To examine how payment failures distribute risk between vendors and customers, including the ways vendors manage failed transactions through informal trust arrangements and customers fall back on cash as a substitute.
4. To assess how existing regulatory mechanisms, particularly the RBI's Turn Around Time and compensation framework, correspond to the operational realities reported by informal vendors experiencing payment failure.
5. To develop policy-relevant implications for improving the reliability, transparency, grievance redress, and accessibility of digital payment systems for informal vendors.

Literature Review:-

Digital Payment Adoption:-

Existing research on digital payment adoption in India has increasingly focused on the factors that shape the uptake of platforms such as UPI, moving beyond the assumption that access to digital infrastructure alone determines adoption. Motheram and Buteau (2026), analysing district-level data across 711 Indian districts between 2020 and 2024, find that the growth of formally registered merchant networks predicts UPI adoption more strongly than

internet connectivity, with merchant-side effects exceeding infrastructure effects by a factor of roughly six in their most robust specifications. Their analysis also shows that once districts cross a threshold of high-speed connectivity, further infrastructure investment yields little additional benefit for bringing new users onto digital payment systems. This suggests that in a market as connectivity-saturated as India's, adoption is increasingly shaped by the density of merchant acceptance networks rather than by technology access alone, a distinction relevant to understanding why a vendor's decision to accept UPI may reflect ecosystem-level pressures as much as an independent assessment of the technology itself.

UPI and Financial Inclusion:-

UPI's success is conventionally established through a fairly consistent set of measures: the number of users onboarded, the volume of transactions processed, the rate at which adoption has spread across user groups, and the extent to which digital payments have expanded access to formal financial services. These indicators provide substantial evidence of UPI's rapid expansion, but primarily measure the scale of participation in the digital payment system. What these measures capture, however, is the scale of entry into the digital payment system. They speak less directly to whether users, once onboarded, can consistently rely on that system for routine economic transactions.

Informal Vendors and Digital Payments:-

A growing body of research examines how informal vendors specifically engage with UPI, as distinct from formal-sector merchants. Kukreti, Kuniyal, and Wadhera (2025), studying 188 street vendors across 20 markets in Delhi-NCR, find that while UPI adoption is associated with higher average daily revenue, adoption decisions are shaped as much by trust in the underlying system and fear of fraud as by transactional convenience, with vendors in their fieldwork frequently describing informal coping strategies for network failures and fraudulent payment screenshots that structured survey instruments did not fully capture. Naik and Shetty (2025), surveying 300 street vendors in urban India, reach a related conclusion from a different angle. While UPI adoption among vendors was widespread and largely gender-neutral in their sample, adoption did not translate into improved savings behaviour or digital competency over time, pointing to structural constraints such as limited digital skills that continue to limit deeper financial integration. Read together, these two studies point to a distinction between UPI adoption and operational reliance, a distinction that has received less attention than adoption rates and that this study examines directly through vendor experiences in Mira-Bhayander Market.

Payment Failures and Reliability:-

Payment failures and delays are also recognised within the regulatory framework. The RBI's September 2019 circular on Harmonisation of Turnaround Time and Customer Compensation formally recognises failed and delayed transactions as requiring defined resolution timelines and compensation mechanisms. However, the framework is oriented toward system-level resolution and consumer protection, structured around how quickly a transaction should be resolved and who is entitled to compensation. It does not address how these timelines interact with vendors' immediate liquidity requirements, including funds needed for same-day or next-day stock purchases. Consequently, a resolution period considered acceptable at the system level may remain operationally inadequate for vendors whose daily activities depend on timely access to funds. Beyond the regulatory framework, transaction-level data published by the National Payments Corporation of India indicates that while system-wide technical decline rates have fallen substantially over the past decade, the sheer scale of UPI's transaction volume means that even a small percentage of technical failures still represents a substantial absolute number of failed transactions each month, sustaining the everyday relevance of the reliability question this study investigates.

Digital Fraud and Trust:-

Fraud has emerged as a significant concern within India's UPI ecosystem. Mukhopadhyay and Mukhopadhyay (2024) report that reported UPI fraud cases rose by 85% between FY2023 and FY2024, while 20.6% of victims in their survey did not report incidents to authorities, indicating a gap between the prevalence of fraud and its visibility in official statistics. Sharma and Singh (2024) examine the mechanisms driving this increase and find that fraud in India's digital payment ecosystem is driven primarily by social engineering, with offenders impersonating trusted authorities and creating urgency around plausible concerns such as blocked accounts or failed transactions, rather than exploiting technical vulnerabilities. Taken together, these studies suggest that vendors' vulnerability to fraud may reflect not only limitations in digital literacy but also the pressure and ambiguity surrounding transactions that appear to fail or remain unconfirmed. This dynamic is directly relevant to the operational uncertainty documented among vendors in this study.

Liquidity and Informal Businesses:-

A separate body of literature helps clarify why this distinction matters for informal vendors. Collins et al., in *Portfolios of the Poor*, distinguish between income and liquidity, noting that adequate income over a longer period does not guarantee the availability of usable funds when needed. Roever's WIEGO-based research on street vendors in India adds an operational dimension, showing that informal vendors typically operate on thin margins, face recurring short-term liquidity needs, and have limited institutional buffers against disruption. Read together, these two strands suggest that for informal vendors, the timing and availability of funds can carry weight comparable to the total amount earned or transferred, potentially increasing vendors' vulnerability to cash-flow disruptions such as digital payment failures.

Research Gap:-

Considered together, these strands of literature establish a consistent picture: UPI adoption has expanded substantially, driven by both merchant ecosystem growth and digital infrastructure; informal vendors engage with UPI unevenly, with adoption not necessarily translating into reliable or sustained usage; fraud within the UPI ecosystem exploits trust and behavioural pressure alongside technical vulnerabilities; and payment failures are recognised as systemic occurrences addressed through formal regulatory mechanisms, even as informal vendors operate under liquidity constraints that make timely access to funds critical to daily operations. However, the literature gives comparatively limited attention to how these dimensions intersect, particularly how payment failures affect UPI using informal vendors through operational disruption, liquidity constraints, and the practical process of managing failed transactions. It also leaves unresolved whether continued UPI use reflects genuine preference or constrained accommodation. This study addresses these questions through fieldwork in Mira-Bhayander Market.

Conceptual Framework:-**Role of Street Vendors in the Urban Economy:-**

Street vending accounts for approximately 14% of total urban informal employment in India, with around 10 million informally skilled street vendors making their livelihood through this sector (Yadav, 2022). From fruit sellers outside railway stations to tea vendors at street corners, these individuals provide affordable goods and essential services to millions of working families every day — at prices formal stores cannot match. Beyond serving daily consumers, street vending acts as an economic safety net. It absorbs millions of migrant workers and daily-wage labourers who are excluded from formal jobs and mainstream banking systems. For these individuals, vending is not a choice but a necessity. Studies show that approximately 67% of urban migrant labourers are absorbed in the informal sector, according to the National Sample Survey Organisation (NSSO, 2012).

What makes this sector fragile is its dependence on continuous daily cash flow. Their business operates on a strict 24-hour loop. Vendors purchase their stock at dawn, sell it throughout the day, and use those immediate earnings to fund tomorrow's inventory, cover transport, and feed their families. In this ecosystem, there are no backup funds, and zero room for delay. The growing adoption of digital payments has fundamentally altered this financial rhythm that vendors long depended on. While digital payments promise greater convenience and financial inclusion, they also introduce new operational vulnerabilities for vendors whose livelihoods depend on uninterrupted cash flow.

Statement of the Problem:-

Every morning at 5:00 AM, a vegetable vendor sets up his stall at Crawford Market. A customer buys a large batch and scans his QR code, but Ramesh's phone shows the payment as "pending." With his money stuck in the bank for hours, he cannot buy vegetables for the afternoon rush. By midday, his stall is empty, forcing him to close early and lose his entire daily income. This is far from an isolated case; it is the silent, daily struggle of thousands of Mumbai vendors caught in the gap between a fast-moving digital economy and the immediate need to survive. This study examines how transaction failures and settlement delays in UPI affect the liquidity, inventory replenishment, and daily revenues of Mumbai's street vendors. In doing so, it addresses a critical gap in existing literature, which has largely emphasised digital payment adoption while overlooking the operational reliability of digital payment systems for informal workers.

Key Concept Definitions:-**Table 1: Operational Definitions of Key Concepts**

Concept	Operational Definition	Indicator/Measure Used in This Study
Liquidity	The ease and speed with which a vendor's earned income can be converted into usable cash without delay	Vendor-reported ability to access funds for same-day or next-day restocking; instances of settlement delay preventing a scheduled purchase (vendor case studies); customer-reported purchase interruption
Hidden Costs	Indirect, non-fee costs arising from UPI participation, including transaction failure costs, withdrawal and settlement charges, delayed settlement, opportunity costs, and data or device maintenance costs	Vendor-reported frequency and type of hidden cost experienced during interviews, categorised across the five cost types identified in this study's framework
Payment Reliability	The consistency with which a UPI transaction completes successfully and results in usable funds within an expected timeframe	Customer-reported frequency of payment failure or delay in the preceding 30 days (survey item 2); vendor-reported frequency of failed or delayed transactions during fieldwork interviews
Vendor Sustainability	A vendor's capacity to maintain continuous daily business operations despite disruptions to cash flow, determined by exposure to disruption rather than cumulative income earned	Vendor-reported instances of operational disruption, such as early closure, inability to restock, or absorption of fraud-related loss, documented across the seven case studies

Liquidity in Informal Businesses:-

For a street vendor, money earned in the morning must often survive the whole day before it can be spent again.

Liquidity refers to the ease with which an asset, or in this case earned income, can be converted into usable cash without loss of value or delay. For most formal enterprises, this is a background condition, supported by bank credit, reserves, and formal financial instruments that absorb short-term gaps between earning and spending. For informal businesses such as street vending, no such support exists, and liquidity becomes a defining constraint on daily operations rather than a background condition. This is why liquidity, not income, is the more accurate measure of vendor financial health for this research. Earning money and having usable money are not the same thing, and treating them as interchangeable obscures the actual constraint vendors face, a distinction established above through Collins et al.'s (2009) income-liquidity framework and Roever's (2014) findings on vendor cash-flow dependence. For a street vendor, then, money earned but not yet in hand is no different from money not yet earned.

This liquidity dependence is structural, not incidental. Informal vendors typically operate without savings buffers, credit lines, or institutional reserves, which makes each day's earnings the primary source of funding for the next day's operations. This daily cycle covers a narrow set of recurring costs: restocking perishable goods, transport, raw materials, household expenses, and the occasional emergency. When cash is available on demand, the cycle continues without disruption. When it is not, even temporarily, the disruption is immediate rather than absorbed.

Two working states follow from this. High liquidity describes a condition in which earned income is accessible and usable without delay. Low liquidity describes a condition in which income has been earned but is temporarily inaccessible, whether due to timing, technical failure, or institutional friction. The two states are not about how much a vendor has earned, but about whether that vendor can act on it.

The gap between these two states becomes directly relevant when examining UPI. Digital payments are often framed as an improvement over cash, since transactions are presented as instantaneous and free of the friction of handling physical currency. In practice, this instantaneity is conditional rather than guaranteed. The Reserve Bank of India's own circular on Turn Around Time and Customer Compensation for failed transactions (RBI, 2019)

acknowledges this, setting a maximum window of one working day for person-to-person transfers and five working days for person-to-merchant payments before a failed transaction must be reversed, with compensation due if banks exceed these limits. The framework confirms that settlement delay and temporary inaccessibility of funds are recognised features of UPI, not edge cases. For a vendor running on same-day cash cycles, even a delay within these permitted windows can be operationally significant.

Consider a fruit vendor who sells ₹3,000 worth of fruit via UPI over the course of a day. On paper, this is a good day: sales occurred, income was earned, and the transaction record is clean. But if that ₹3,000 remains unsettled overnight, even within RBI's permitted turnaround time, the vendor may be unable to use it to restock the next morning. The sale happened, but usable liquidity did not necessarily follow. This distinction is central to the research. Liquidity is not simply another word for income; it is a distinct condition, determined by how quickly funds move, how reliably they arrive, and whether the vendor can access them, not by transaction volume alone. Vendor sustainability rests on continuous liquidity rather than cumulative earnings. It is this distinction that motivates the analysis in the following sections, which examine specific points in the UPI settlement chain where this continuity breaks down.

Hidden Costs of UPI:-

No fee appears on the receipt, yet the cost is still paid:-

UPI is often presented as a free and frictionless payment system, and at the level of a single transaction this is largely accurate. What this framing overlooks is that participation in the UPI ecosystem carries a set of indirect costs. These costs do not appear on any receipt, but they still affect a vendor's day-to-day cash position. They are not failures of the system in a narrow technical sense. Rather, they are structural features of digital payment infrastructure, features that affect informal vendors differently than they affect formal businesses, because informal vendors lack the reserves needed to absorb them. The five categories below explain how this hidden cost structure operates in practice.

Transaction Failure Costs:-

A failed UPI transaction is rarely just a technical inconvenience for a street vendor. It is an operational event with immediate consequences. A payment stuck in a "processing" state delays the vendor's access to funds that have already been earned. In some cases, a customer unwilling to wait simply leaves without completing the transaction, converting a near-sale into a lost one. Where a failure requires resolution, the time spent following up with a bank or checking transaction status is time not spent serving other customers. Even when a failed transaction eventually settles correctly, the vendor experiences a temporary reduction in working cash while it remains unresolved. Consider a vendor who sells fruit worth ₹500, only for the customer's payment to remain marked as processing. The sale is not lost in the accounting sense, since the transaction will likely settle. But in the immediate term, the vendor cannot use that ₹500 to restock, because the money is not yet usable. This is the same liquidity gap discussed in section 3.3.1, now understood specifically as a cost rather than a delay. What looks like a minor technical delay on the customer's end can, for the vendor, become a direct and immediate cost.

Withdrawal and Settlement Charges:-

The absence of a fee on the transaction itself does not mean the vendor accesses that money for free. Converting a digital balance into usable cash, or moving funds between accounts, can carry costs of its own. These may take the form of charges on repeated ATM withdrawals, fees tied to specific banking services, or charges levied through third-party merchant platforms that vendors use to manage their UPI payments. Individually, these charges are usually small enough to go unnoticed. Across the volume of transactions a vendor processes over weeks and months, however, they accumulate into a real, if largely invisible, operating cost.

Delayed Payment Settlement:-

Digital payments do not always offer the same instant liquidity that cash does. A vendor waiting for a digital payment to settle cannot use that money to buy fresh inventory, pay a supplier, cover transport, or meet a household expense that cannot wait. Cash payments do not create this problem, because the money is usable the moment it is received. Digital payments introduce a window, however short, during which earned money and usable money are not the same thing.

Opportunity Cost of Locked Funds:-

Opportunity cost refers to the value of an alternative that is given up when a delay forecloses it. Applied here, this means that the cost of locked funds is not only the inconvenience of waiting but the specific opportunities that

waiting eliminates. A vendor who receives ₹3,000 digitally may find that a settlement delay prevents them from purchasing discounted stock available only that day. The funds exist and will eventually settle, but the opportunity they were needed for does not wait. The resulting lost profit is a cost the vendor may absorb entirely, even though no fee was charged and no transaction technically failed.

Data and Smartphone Maintenance Costs:-

Beyond the costs tied to individual transactions, UPI participation requires vendors to maintain a baseline level of digital infrastructure simply to remain eligible to accept digital payments at all. This includes recurring mobile data expenses, the cost of purchasing and repairing a smartphone, regular charging, and keeping payment applications updated and functional. Unlike the costs described above, these are not triggered by any specific transaction or failure. They are ongoing costs of access, incurred whether or not a given day's transactions go smoothly, and they represent a fixed operational burden that cash-based vending does not carry. Ask a vendor whether UPI charges a fee, and the answer will almost always be no. Ask what UPI actually costs them, and the answer looks very different.

Taken together, transaction failure costs, withdrawal and settlement charges, delayed settlement, opportunity costs, and access-maintenance costs constitute a hidden cost structure beneath the transaction-level framing of UPI as free and convenient. These costs are largely absent from adoption statistics, yet each draws on the same underlying resource: vendor liquidity, as defined in the preceding section. While individually modest, their cumulative effect can progressively constrain the cash available for daily operations, even when transactions are recorded as successful. The following section formalises this cumulative effect through a structural model linking digital payment adoption to vendor sustainability.

Payment Reliability:-**A transaction can succeed and still fail the person relying on it:-**

Payment reliability, as used in this study, refers to whether a digital transaction is completed quickly enough for a vendor to actually use the money, not simply whether it is eventually recorded as successful. A transaction that takes hours to settle, or briefly fails before going through, is still logged as a success in most reporting systems. For the vendor waiting on that money, however, the delay itself is the practical problem. This study is concerned with that gap, the difference between a transaction being technically successful and a vendor being able to depend on it in the moment it is needed.

For a formal retailer with savings or credit to draw on, an occasional slow or failed transaction may pass without consequence. For an informal vendor already operating on the tight daily margins described in the preceding sections, the same delay can determine whether the next round of stock is bought on time. Payment reliability is therefore treated in this study not as a fixed technical property of the payment system, but as a condition whose real impact depends on who is experiencing it and how much room they have to absorb a delay. This is precisely the relationship examined through the vendor fieldwork that follows.

Vendor Sustainability:-**A vendor can be counted as digitally included and still be one bad transaction away from closing early:-**

Vendor sustainability, for this study, refers to an informal vendor's ability to keep operating from one day to the next: restocking on schedule, covering recurring costs such as transport and rent, and maintaining enough working capital to avoid disruptive responses such as closing early, reducing stock, or turning to informal borrowing to cover a shortfall. This is a narrower definition than business growth or long-term formalisation. For a population operating without institutional financial buffers, continuity itself is the more meaningful measure of success than expansion. Understood this way, vendor sustainability sits downstream of the two constructs already established in this study. Where liquidity disruption describes a temporary state in which earned funds are inaccessible, and hidden costs describe the recurring drains on a vendor's cash position, vendor sustainability describes the cumulative outcome of repeated exposure to both. A single delayed settlement may not threaten a vendor's continuity on its own. Repeated exposure, absorbed by a vendor with no buffer to draw on, plausibly does. The fieldwork in Mira-Bhayander Market therefore examines whether and how such disruptions affect day-to-day continuity and the strategies vendors use to manage them.

The Conceptual Model:-

This section presents a conceptual framework that connects the constructs developed in the preceding sections into a sequential structure. The framework proposes that digital payment adoption is not directly associated with vendor

sustainability, but relates to it through two intervening constructs: hidden costs and liquidity constraints. Digital payment adoption is associated with the emergence of hidden costs; hidden costs are in turn associated with liquidity constraints; and liquidity constraints are the construct most closely associated with vendor sustainability. This four-part sequence forms the analytical backbone for the rest of this research, understood as a pattern of association rather than a proven causal pathway.

Digital Payment Adoption:-

The framework begins with a vendor's decision to accept UPI as a payment mode. Vendors typically adopt UPI to meet customer demand for convenience, reduce the burden of handling and storing cash, and avoid losing customers who prefer digital payments. At this stage, adoption is a rational and often necessary business decision. It also marks the point at which vendors become exposed to costs not present in cash-based transactions.

Hidden Costs:-

Once a vendor begins accepting UPI, exposure to hidden costs, as defined in the preceding section, becomes possible. Much of this exposure traces back to payment reliability: when a transaction is slow to settle or fails outright, the vendor may absorb the resulting cost, whether through lost time, a walked-away customer, or a temporary reduction in usable cash. Payment reliability therefore influences the frequency and severity of hidden costs incurred by vendors. This burden does not remain confined to the transaction level. It extends further, affecting whether earned income is actually usable when the vendor needs it.

Liquidity Constraints:-

The accumulation of hidden costs is associated with liquidity constraints, defined earlier in this study as limited access to cash when needed. This may manifest as unstable daily cash flow, delayed restocking, and short-term business decisions shaped by cash availability. At this stage, digital payment adoption extends beyond operational inconvenience to constrain day-to-day business operations.

Vendor Sustainability:-

The framework's final construct is vendor sustainability, the outcome most closely associated with liquidity constraints. It encompasses the ability to maintain continuous operations, withstand short-term financial shocks, and sustain the vendor's livelihood over time. Sustainability, rather than income alone, is treated as the appropriate endpoint because a vendor may generate substantial revenue while remaining operationally unstable and financially vulnerable.

The relationship can be summarised as follows:-

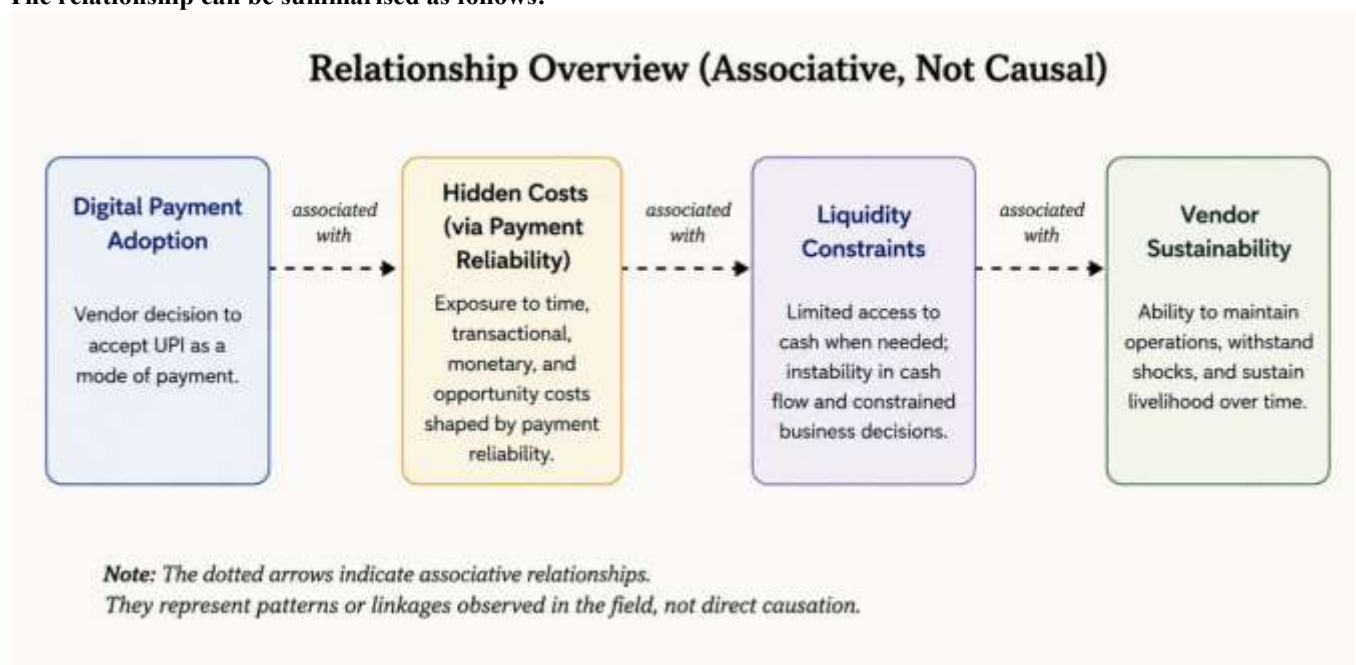


Figure 1: Associative Relationship Between Digital Payment Adoption and Vendor Sustainability.

Together, these constructs suggest that the relationship between digital adoption and a vendor's business is neither direct nor automatic. Adoption creates exposure to hidden costs, shaped in large part by payment reliability, which are in turn associated with the liquidity constraints described earlier in this study. These constraints, in turn, appear closely linked to business sustainability over time. The framework therefore highlights that aggregate adoption statistics do not show whether vendors can convert digital earnings into usable working capital.

Table 2: Sample Composition

Study Sample (N = 111)	Composition
Vendors (n = 55)	45 roadside sellers; 5 food van owners; 5 small shop owners
Customers (n = 56)	56 survey respondents

Research Methodology:-

Research Design:-

This study adopts a mixed-methods research design, combining qualitative interviews with informal vendors, a quantitative survey of customers, and secondary information relating to digital payment systems and UPI infrastructure in India. The qualitative component was designed to capture the operational and experiential dimensions of payment failure that are difficult to quantify, such as how a vendor responds when a transaction appears to fail. The quantitative component was designed to establish the scale and frequency of failure-related disruption from the customer-facing side of the same transactions. Secondary sources, including RBI circulars and NPCI ecosystem statistics, were used to situate these findings within the broader regulatory and infrastructural context of UPI in India. This combination was chosen because payment reliability is not a phenomenon that vendor narratives or customer statistics alone can fully describe; each source of data addresses a gap the other leaves open.

Study Area:-

Fieldwork was conducted at Mira-Bhayander Market, selected primarily for researcher accessibility. The researcher's proximity to the market enabled sustained engagement with vendors, repeated visits for clarification, and greater familiarity with vendors and their operating conditions than would have been possible through a single visit. This accessibility-based site selection is consistent with the study's reliance on convenience sampling (Section 4.5) and is treated as a defined scope condition of the findings rather than concealed as a limitation.

Vendor Sample:-

The vendor sample consisted of 55 informal vendors, comprising 45 roadside sellers, 5 food van owners, and 5 small shop owners. This composition was intended to capture variation across different forms of informal vending present within the same market, rather than to represent their relative proportions in the wider vendor population.

Customer Sample:-

The customer sample consisted of 56 valid responses collected through a 10-item survey administered via Google Forms. Customers were surveyed to establish the frequency and consequences of UPI payment failures from the transacting party's perspective, complementing the vendor-side account of the same disruptions.

Sampling Method:-

Both the vendor and customer samples were drawn using convenience sampling, a form of non-probability sampling in which respondents were selected based on their availability and willingness to participate during the fieldwork period, rather than through random selection from a defined sampling frame. This method was appropriate given the practical constraints of approaching informal vendors during active business hours and reaching customers within the same market ecosystem, but it means the sample cannot be assumed to be statistically representative of informal vendors or UPI users beyond the study population. This limitation is addressed further in the Limitations section.

Data Collection:-

Vendor fieldwork was conducted over four days from 20 to 23 July, using verbal interviews conducted in Hindi, Marathi, or a mixture of both, depending on the respondent's preference. Data were recorded through a combination of voice recordings and real-time written documentation. The customer survey was administered separately through a structured 10-item Google Forms questionnaire, covering UPI usage frequency, experience of payment failure, and its effect on completed purchases.

Data Analysis:-

Vendor interview data were analysed thematically to identify recurring patterns relating to liquidity, payment failures, settlement delays, fraud, digital literacy, and cash preference. This approach was chosen over a strictly quantitative coding scheme because the vendor interviews were designed to surface operational experience in vendors' own words, and thematic analysis preserves that texture while still allowing patterns to be identified systematically across respondents. Customer survey responses were analysed using frequencies, percentages, and cross-tabulations, with tests of association used where appropriate to examine relationships between selected categorical variables, such as the relationship between failure frequency and the likelihood of switching to cash. Given the sample size, cross-tabulations with small subgroup counts are presented descriptively rather than tested for statistical significance, as formal significance testing would overstate the precision such small cells can support.

Sample and Generalisability:-

The study is based on a relatively small convenience sample of 55 informal vendors and 56 customer respondents from a single market, Mira-Bhayander Market. Given the sample size, sampling method, and geographic scope, the findings should be interpreted as exploratory and indicative of patterns within the study population, rather than statistically representative of informal vendors or UPI users across India. This is consistent with the treatment of the vendor case studies, which are presented as illustrative rather than representative.

Results:-**Case Study Analysis: Understanding Vendors' Perspectives****Table 3: Vendor Demographic Characteristics (n = 55)**

Characteristics	Value
Gender	35 male, 20 female
Age range	25 to 63 years
Smartphone ownership	100% (all vendors owned a smartphone)

Fifty-five vendors were asked a question: cash or UPI. The answers did not divide by age, business size, or how digitally comfortable each vendor appeared to be. Two vendors selling nearly identical goods, standing feet apart in the same market, frequently gave opposite answers, and neither was factually wrong about their own experience. This section examines seven of those vendors individually, then compares their accounts to explain what the aggregate numbers alone cannot: the different relationships vendors have with the same payment system.

Survey Logistics:-

Fieldwork for this study was conducted over four days, from July 20 to July 23, at Mira-Bhayander Market. Fifty-five vendors were surveyed in total: forty-five roadside vendors operating without a fixed structure, five food van owners, and five small shop owners, whether renting or owning their premises. Interviews were administered verbally rather than via a self-report instrument, conducted in Hindi, Marathi, or a mix of both, depending on each vendor's comfort. This approach was deliberate: a written survey format would likely have excluded or underrepresented older and less formally educated vendors, who make up a meaningful share of this sample. Of the fifty-five interviews, twenty were captured as voice recordings in the vendor's own words; the remainder were documented verbally by the interviewer in real time, as many vendors were not comfortable being recorded.

Reasons & Patterns:-**Six reasons recur across these interviews and structure the analysis below:-**

1. **Liquidity access** — difficulty obtaining cash when needed
2. **Supply-chain timing** — needing same-day cash to restock from wholesalers
3. **Institutional friction** — the documentation and procedural burden of bank withdrawals
4. **Digital Literacy Barriers** — difficulty navigating digital payment systems
5. **Fraud/scam-driven loss** — direct financial loss reshaping preference
6. **Settlement costs** — fees that reduce already thin profit margins

Case 1: Elderly Roadside Vendor:-

Issue: Digital literacy barriers associated with repeated fraud exposure

Evidence: The vendor stated an immediate and unqualified preference for cash. He reported being scammed five to six times, which he attributed to his limited understanding of the system. He continues accepting UPI only because customers expect it and said he would stop using it if the choice were entirely his.

Interpretation: This case suggests that low digital literacy extends beyond reduced comfort with digital payments and may increase vulnerability to fraud. The repeated losses indicate an ongoing risk associated with unfamiliarity with transaction verification rather than a single lapse.

Implication: By adoption metrics alone, this vendor would be recorded as a successful daily UPI user. His experience of repeated, uncompensated loss illustrates why adoption figures cannot capture the reliability gap this study investigates.

Case 2: Tea Shop Owner:-

Issue: Operational preference for UPI shaped by business model rather than digital comfort

Evidence: The vendor expressed a clear preference for UPI, citing reduced need to manage change, less physical handling of cash, and a digital record that simplifies monthly accounting. He reported no negative experiences with the system and did not consider the tax implications of his transaction volume a meaningful concern.

Interpretation: This case suggests that comfort with UPI can follow from a business model in which digital payment reduces existing operational burdens such as cash handling and manual reconciliation, rather than from digital literacy or generational familiarity with technology alone.

Implication: The six reliability-gap reasons identified in this study appear to be unevenly distributed across vendor types rather than representing a uniform negative consequence of UPI adoption. For businesses with frequent, low-value, repeat transactions, UPI may reduce administrative effort rather than introduce difficulty.

Both vendors face similar customer expectations, yet exhibit different payment preferences. The elderly vendor's transactions rely on immediate trust without a verification process he can consistently navigate, increasing his vulnerability to exploitation. In contrast, the tea shop owner's transactions are repetitive and predictable, enabling UPI to reduce settlement friction without introducing comparable risks. Thus, the effects of the same payment technology vary according to the operational characteristics of the vendor's business.

Case 3: Flower Vendor:-

Issue: Digital literacy barriers compounded by network and withdrawal difficulties

Evidence: The vendor struggled to understand basic terminology around digital payments, not only the mechanics of the app. She also described difficulty withdrawing money already credited to her account and frequent network connectivity issues that interrupted transactions. She continues accepting UPI to meet customer expectations but would prefer cash, citing its simplicity and reliability, particularly for next-day restocking.

Interpretation: This case suggests that limited digital understanding can extend beyond inconvenience into an operational barrier, since difficulty navigating the system made it harder to verify transactions, access received funds, and respond when payments failed.

Implication: This case illustrates why adoption metrics cannot capture a vocabulary or comprehension gap. She would be classified as an adopted UPI user in any survey that only asks whether digital payments are accepted, despite having an incomplete understanding of the system underlying that use.

Case 4: Food Van Owner:-

Issue: UPI functioning as a trust and verification mechanism for remote transactions

Evidence: The vendor described receiving large orders from customers outside his usual operating area, arranged by phone rather than in person. UPI allows payment to arrive and be confirmed before he commits time or ingredients to the order, removing his reliance on a customer's word that payment would eventually follow.

Interpretation: This case suggests that UPI preference is not limited to point-of-sale convenience. For a business model involving customers who are not physically present, UPI can function as a verification mechanism that confirms payment before goods are provided.

Implication: This case broadens the reliability-gap framework to include a use case largely absent from existing UPI adoption literature: digital payment as a trust mechanism for non-local transactions, rather than only a face-to-face payment method.

Both the flower vendor and the food van owner encounter friction beyond a simple in-person exchange, one through withdrawal and connectivity, the other through distance and order confirmation. Yet one experiences this friction as a cost UPI introduces, and the other experiences a similar category of friction as a problem UPI resolves. For the flower vendor, completion of a transaction depends on infrastructure she cannot control. For the food van owner,

completion depends on the payment assurance UPI provides. The same technology, applied to different transactional requirements, appears to produce opposite assessments of its reliability.

Case 5: Vegetable Vendor:-

Issue: Compounded liquidity, settlement cost, and fraud pressures

Evidence: The vendor's business depends on same-day cash to buy fresh stock before prices rise. UPI settlement delays and associated fees reduced the funds available for this purpose, and on at least one occasion a failed transaction prevented him from paying a wholesaler on schedule. He also described repeated fraud incidents involving fake payment screenshots, including one instance where a customer left with ₹8,000 worth of produce after showing a fabricated screenshot.

Interpretation: This case suggests that cash preference can result from the interaction of multiple pressures rather than any single one. Settlement timing, transaction fees, and fraud each appear to create independent pressure toward cash, and in this case all three were present at once.

Implication: This is the most compounded example of the reliability gap in the sample, carrying three of the six identified reasons rather than one or two. It suggests the reliability gap is not evenly distributed even within the cash-preferring group, and that vendors dealing in perishable stock may face structurally greater constraints than those selling non-perishable goods, a distinction adoption data alone cannot reveal.

Case 6: Street Food Vendor:-

Issue: Operational indifference between cash and UPI

Evidence: The vendor stated he genuinely had no preference between cash and UPI. The transaction fee did not register as a concern, and he reported no difficulty using the system. His current use of UPI reflects whichever method a given customer prefers in the moment, rather than any independent evaluation on his part.

Interpretation: This case suggests that not all UPI use in this sample reflects either constrained preference or active endorsement. For some vendors, the payment method carries no meaningful cost or benefit in either direction, with adoption shaped primarily by external demand rather than personal preference.

Implication: This case establishes a baseline against which the other cases can be read, and prevents the reliability-gap findings from being overstated as universal across all UPI-using vendors. The clearest contrast between the vegetable vendor and the street food vendor lies not in what they sell but in how closely they attend to their payment method. The vegetable vendor remains highly attentive, having experienced direct loss through settlement delays and fraud. The street food vendor shows no comparable attentiveness, having encountered no similar loss. Both sell perishable stock, yet only one treats UPI as a source of financial strain, suggesting that perishability alone does not explain cash preference. Prior exposure to loss through the payment system appears to be the more relevant factor. Where such exposure exists, preference for cash tends to hold regardless of customer demand. Where it does not, preference remains largely unformed, and customer demand determines the outcome by default.

Case 7: Fruit Seller:-

Issue: Preference conditional on the frame of the question, personal versus business

Evidence: Asked about personal preference, the vendor chose cash, citing the same-day wholesaler payment need described in Case 5. Asked from a business standpoint, he chose UPI, citing the ability to receive large, short-notice orders with instant, confirmed payment before committing to fulfil them.

Interpretation: This case suggests that preference is not always a fixed attribute of a vendor. It can be conditional on the frame in which the question is asked, with the vendor holding two internally consistent but opposing positions, each grounded in a different operational requirement of his business.

Implication: This case shows that the reliability gap identified in this study is not only a difference between vendors, but can also exist within a single vendor's own business, affecting different parts of his operations in opposite directions.

Synthesis:-**Defining Reliability:-**

Before concluding these cases, it is necessary to specify what "reliability" means in this study. Reliability refers to whether a payment system consistently completes transactions as intended, makes funds accessible without undue delay, and protects users from fraudulent exploitation. It does not refer to whether a vendor has adopted the system or continues to use it. This distinction matters because, as the cases below indicate, continued use of UPI is not, on its own, evidence that the system is functioning reliably for the vendor using it.

One Statistic, Four Underlying Relationships:-

All seven vendors examined here report using UPI. As a single figure, this would read as straightforward adoption. Examining the reasoning behind each vendor's use suggests otherwise. Two vendors, the tea shop owner and the food van owner, genuinely prefer UPI, each for reasons specific to their business. One vendor, the street food seller, has no preference; his use reflects customer demand rather than independent evaluation. Three vendors, the elderly vendor, the flower vendor, and the vegetable vendor, prefer cash but continue accepting UPI due to customer expectation. One vendor, the fruit seller, holds different preferences depending on whether the question is framed personally or as a business decision. An adoption statistic cannot distinguish a vendor whose needs are met by the system from one who has stopped resisting it, or one for whom the choice carries no real consequence. The case detail above is intended to make that distinction visible.

Interactions Among Reliability-Gap Factors:-

Read together, the six reliability-gap reasons appear to interact rather than operate independently. Technical unfamiliarity does not remain a self-contained inconvenience: in the elderly vendor's account, it preceded repeated fraud, suggesting unfamiliarity may increase vulnerability to exploitation. In the flower vendor's account, difficulty with basic terminology co-occurred with difficulty withdrawing funds already received, suggesting comprehension and infrastructural barriers compound one another. Reliability failures in the stricter sense, transactions not completing as intended, were reported mainly by vendors with narrow liquidity margins. The vegetable vendor's failed transaction delayed a wholesaler payment; the flower vendor's network interruptions disrupted sales mid-transaction. Fraud functions as a related failure, where the system does not fail technically but fails to prevent misuse, as reported by both the elderly vendor and the vegetable vendor.

Settlement fees were reported by multiple vendors but carried different weight depending on business structure. The vegetable vendor described them as a real strain on thin, perishable stock margins; the tea shop owner described an equivalent fee as negligible. The weight of these fees appears linked to liquidity buffer and stock perishability, rather than to the fee itself. Liquidity mismatch, the need for same-day cash to restock, appeared in both the vegetable vendor and the fruit seller, and appeared strong enough to outweigh a personal preference for UPI in both. This suggests the mismatch is driven by the physical nature of the goods sold rather than by digital literacy or trust. The food van owner's case indicates these findings should not generalise into a claim that UPI is unreliable across all conditions. His account suggests UPI can function as a trust mechanism for non-local transactions in ways cash cannot, indicating that reliability varies by transaction type and business requirement.

Adoption Metrics and the Limits of Participation Data:-

Adoption data record whether a vendor uses UPI, not whether the system is reliable for that vendor. The cases above show that active use can coexist with fraud exposure, settlement strain, or liquidity mismatch. As noted in Section 4, these seven cases are illustrative examples drawn from the 55-vendor sample and are not a statistically representative subsample. The interpretations offered here should be read as suggestive rather than conclusive.

Table 4: Mapping of Vendor Cases to Reliability-Gap Reasons

Case	Empirical observation	Theme(s) / mechanism(s)	Analytical interpretation
1. Elderly roadside vendor	Prefers cash; reported 5–6 fraud incidents linked to limited digital understanding.	Digital literacy; Fraud/scam loss	Adoption can coexist with low comprehension and fraud vulnerability.
2. Tea shop owner	Prefers UPI for easier cash handling and accounting; no negative experiences.	Operational preference	UPI can reduce operational burdens rather than create reliability problems.
3. Flower vendor	Struggles with digital terminology, withdrawals, and network connectivity.	Digital literacy; Institutional friction; Liquidity access	Digital unfamiliarity can become an operational constraint.

4. Food van owner	Uses UPI to confirm payment before fulfilling remote orders.	Remote-transaction trust	UPI can resolve payment-assurance problems in remote transactions.
5. Vegetable vendor	Needs same-day cash; reported settlement costs, delays, and fraud losses.	Supply-chain timing; Settlement costs; Fraud/scam loss	Multiple pressures reinforce cash preference and liquidity vulnerability.
6. Street food vendor	Has no preference and accepts whichever method customers use.	Operational indifference	UPI use can reflect customer demand rather than vendor preference.
7. Fruit seller	Prefers cash for wholesaler payments but UPI for large remote orders.	Liquidity access; Remote-transaction trust	Payment preference can vary with the operational context.

Survey Analysis: Understanding Customers' Perspectives:-

Methodology:-

Data for this study were collected using a structured ten-item questionnaire administered via Google Forms to customer respondents, yielding a total of 56 valid responses (N = 56). The instrument paired behavioural and frequency-based indicators (e.g., frequency of UPI use, incidence of payment failure) with corresponding attitudinal and intention-based indicators (e.g., perceived impact of failure on vendors, likelihood of increased cash-carrying under hypothetical conditions), enabling each thematic section of this analysis to examine not only what respondents experienced but also how they interpreted or responded to it. As a convenience sample collected through a single self-administered online instrument, findings should be interpreted as indicative of patterns within the surveyed population rather than statistically generalizable to a broader population.

Baseline UPI Dependence Among Customers:-

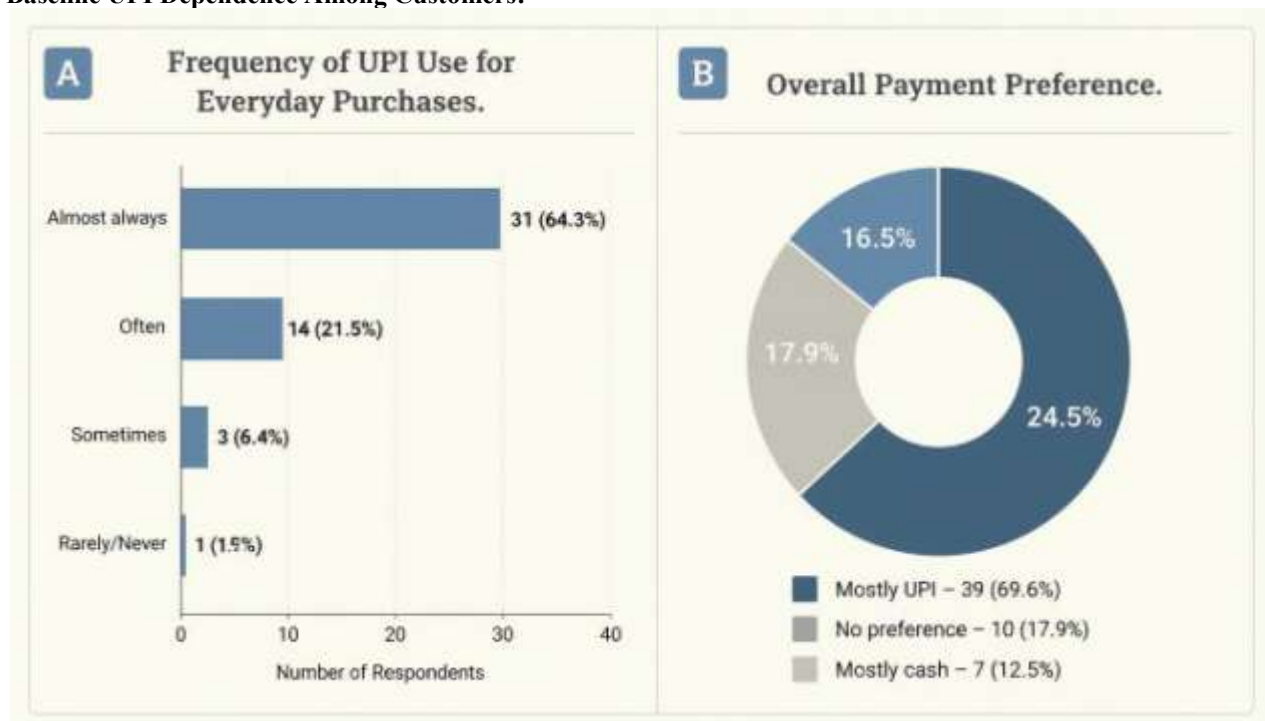


Figure 2: Frequency of UPI Use and Overall Payment Preference Among Customers

Overview:-

This section presents two indicators of customer dependence on UPI for everyday transactions: how frequently customers use UPI for small purchases such as street food, auto-rickshaw fares, and small shop transactions, and which payment method they identify as their overall preference.

Data:-

As shown in Figure 2, 92.9 per cent of respondents reported using UPI either almost always or often for everyday small purchases, with only 1.8 per cent reporting rare or no use. Stated preference follows a similar pattern, with 69.6 per cent identifying UPI as their primary payment method, compared with 12.5 per cent preferring cash and 17.9 per cent having no fixed preference.

Table 5: UPI Usage Frequency and Preference

Indicator	Category	Percentage
Frequency of UPI use for small purchases	Almost always / often	92.9%
	Rarely / never	1.8%
Overall payment preference	UPI	69.6%
	Cash	12.5%
	No fixed preference	17.9%

Respondents who used UPI almost always were also the most likely to report a recent payment failure (80.6%), compared with those who used it less frequently, suggesting that heavier reliance on UPI is associated with greater exposure to its failures rather than insulation from them.

Table 6: UPI Use Frequency × Experience of Recent Payment Failure

UPI use frequency	Failed (last 30 days)	No failure
Almost always (n=36)	29 (80.6%)	7 (19.4%)
Often (n=16)	10 (62.5%)	6 (37.5%)
Sometimes (n=3)	1 (33.3%)	2 (66.7%)
Rarely/Never (n=1)	1 (100%)	0

Interpretation:-

These findings indicate that UPI functions as the default rather than an occasional payment method among respondents. Its high usage frequency and clear preference suggest that digital payment has become the expected mode of transaction, rather than a method used interchangeably with cash.

Frequency and Severity of Payment Failure:-**Figure 3: UPI Failure Frequency and Purchase Disruption Among Customers**

Overview:-

This section looks at how often UPI payments actually fail, and whether these failures stop a purchase from going through. Two indicators are presented: how often respondents faced a UPI failure or delay in the last 30 days, and whether a failure has ever fully stopped them from completing a purchase.

Data:-

As shown in Figure 3, 73.2 per cent of respondents experienced at least one UPI failure or delay in the last 30 days, with 48.2 per cent experiencing it 1 to 3 times and 25 per cent experiencing it 4 or more times. Separately, 80.4 per cent of respondents said a UPI failure had at some point stopped them from completing a purchase, and 57.1 per cent said this happened a few times.

Table 7: Payment Failure Frequency and Severity

Indicator	Category	Percentage
Failure/delay in last 30 days	At least once	73.2%
	1 to 3 times	48.2%
	4 or more times	25%
Failure ever stopped a purchase	Yes	80.4%
	Happened a few times	57.1%

Respondents who experienced a recent failure were more likely to report having had a purchase interrupted at some point than those who had not (87.8% versus 60.0%), suggesting a cumulative rather than isolated pattern of disruption.

Table 8: Payment Failure × Purchase Interruption

	Purchase interrupted	Not interrupted
Failed recently (n=41)	36 (87.8%)	5 (12.2%)
No recent failure (n=15)	9 (60.0%)	6 (40.0%)

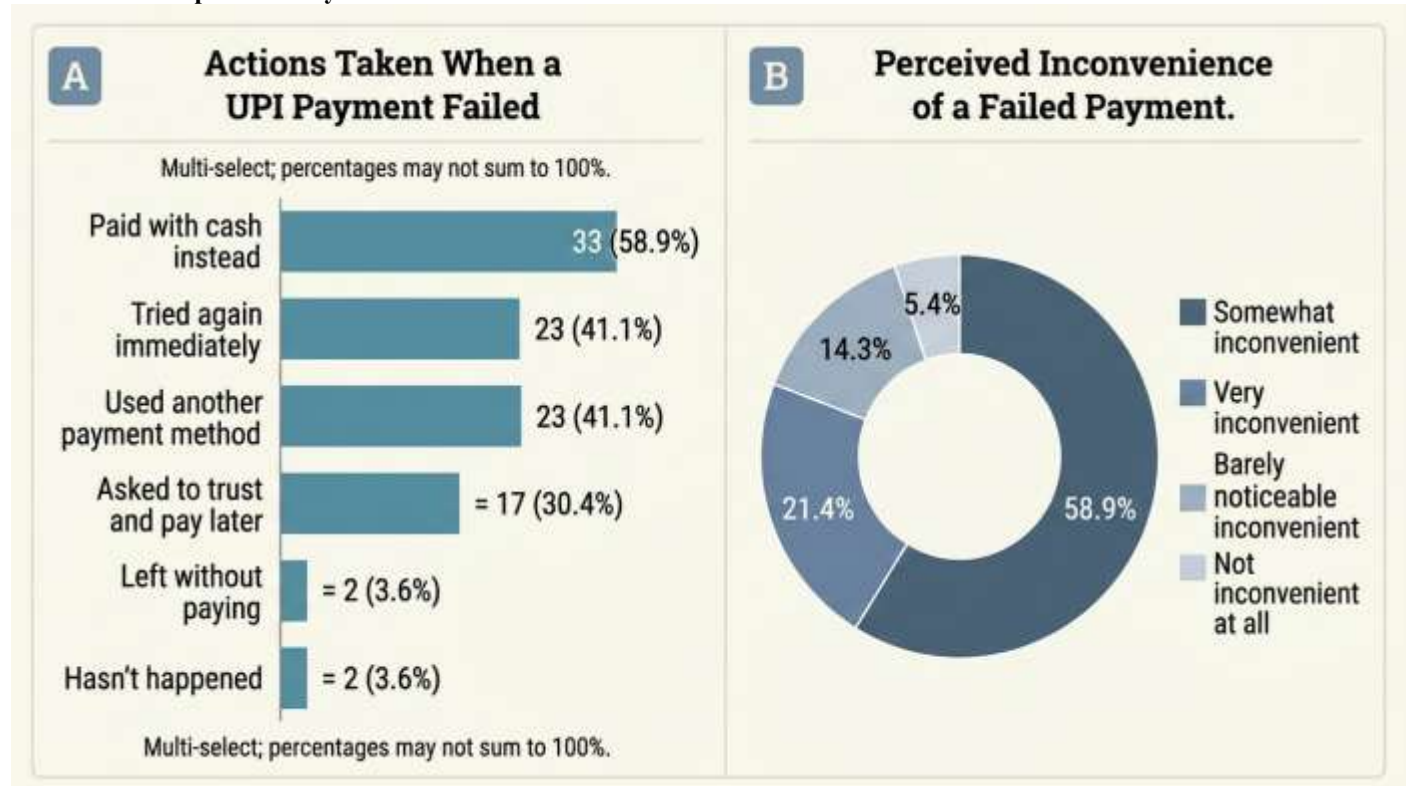
Perceived inconvenience rose with failure frequency, from 60.0% among respondents with no recent failure to 100% among those experiencing more than ten, indicating that inconvenience appears to compound with repeated exposure rather than remain constant.

Table 9: Failure Frequency × Perceived Inconvenience

Failure frequency	Somewhat/Very inconvenient	Barely/Not inconvenient
Never (n=15)	9 (60.0%)	6 (40.0%)
1–3 times (n=27)	23 (85.2%)	4 (14.8%)
4–10 times (n=11)	10 (90.9%)	1 (9.1%)
More than 10 times (n=3)	3 (100%)	0

Interpretation:-

These findings indicate that payment failure is a common rather than an exceptional experience among UPI users. A majority of respondents experienced at least one disruption within a single month, and a large majority have, at some point, had a purchase go uncompleted because of such a failure. This establishes payment failure as a recurring feature of the customer transaction experience rather than an isolated event.

Behavioural Response to Payment Failure:-**Figure 4: Customer Responses and Perceived Inconvenience Following UPI Payment Failure****Overview:-**

This section examines customers' behavioural responses to UPI payment failures and their perceived inconvenience. It considers two indicators: the action taken following the most recent payment failure and the reported level of inconvenience associated with such failures.

Data:-

As shown in Figure 4, when a UPI payment failed, 58.9 per cent of respondents paid with cash instead, 41.1 per cent tried the payment again, and another 41.1 per cent switched to a different payment method. Notably, 30.4 per cent asked the vendor or driver to trust them and allow payment later. 3.6 per cent left without paying. Separately, 80.3 per cent of respondents rated a UPI failure as at least somewhat inconvenient, with 21.4 per cent calling it very inconvenient.

Table 10: Behavioural Response and Inconvenience

Response when payment failed	Percentage
Paid with cash instead	58.9%
Retried payment	41.1%
Switched to a different payment method	41.1%
Asked to pay later (trust-based)	30.4%
Left without paying	3.6%
*Perceived inconvenience	
At least somewhat inconvenient	80.3%
Very inconvenient	21.4%

Respondents who experienced a recent failure were more likely to have switched to cash at their last failed transaction than those who had not (70.7% versus 26.7%), suggesting that cash continues to function as an active fallback rather than a habit unrelated to failure experience.

Table 11: Payment Failure × Switching to Cash

	Switched to cash	Did not switch to cash
Failed recently (n=41)	29 (70.7%)	12 (29.3%)
No recent failure (n=15)	4 (26.7%)	11 (73.3%)

Interpretation:-

These findings indicate that customers respond to payment failure through multiple concurrent methods rather than a single fixed response. Cash constitutes the most common recourse, though a comparable proportion of respondents continue to pursue digital payment through retry or substitution. A notable proportion of respondents also relied on deferred, trust-based payment arrangements with the vendor or driver, indicating that informal understanding between transacting parties functions as an additional mechanism for resolving payment failure. The high proportion of respondents reporting inconvenience confirms that these coping methods do not eliminate the disruption caused by failure.

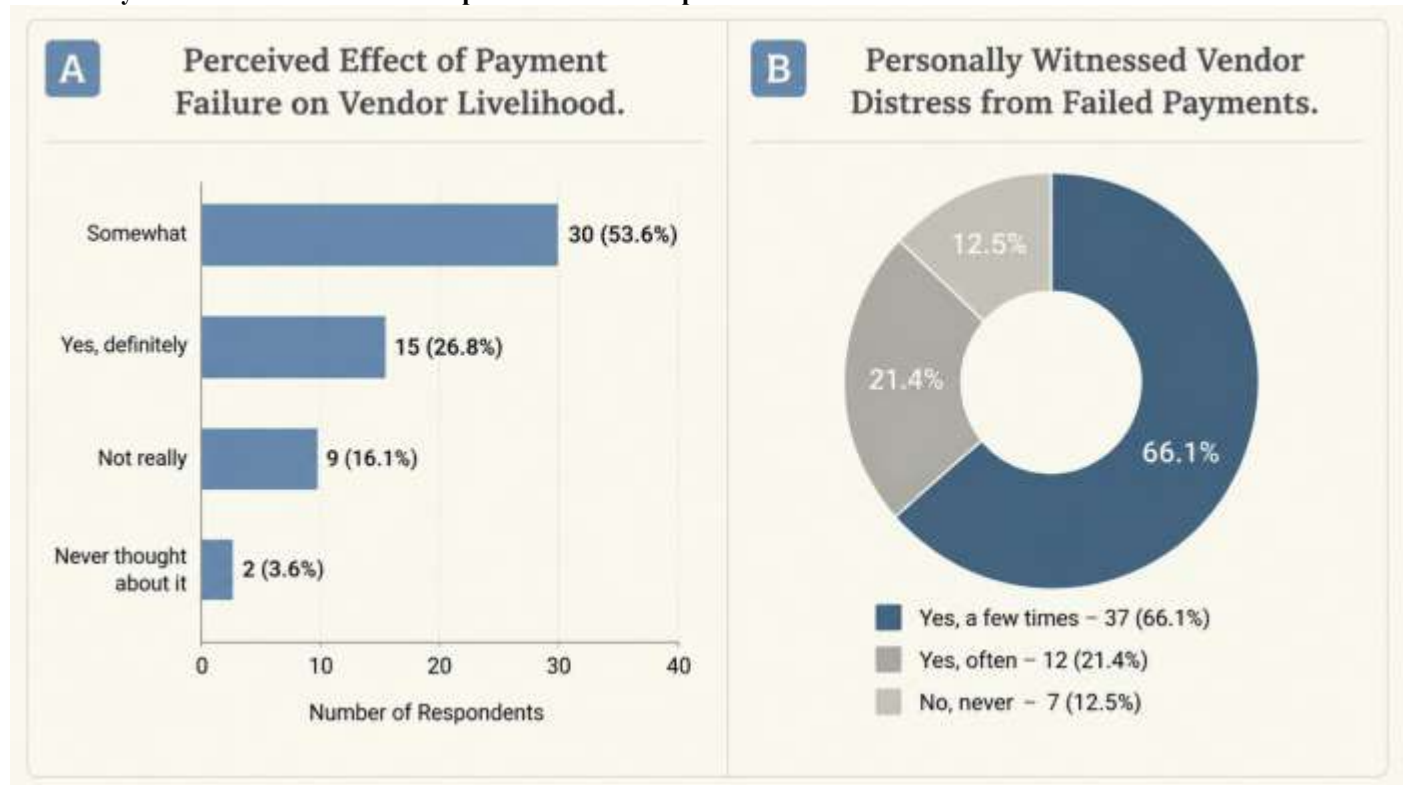
Externality Awareness: Customer Perception of Vendor Impact:-

Figure 5: Customer Perceptions of Vendor Impact from UPI Payment Failures

Overview:-

This section examines the extent to which customers perceive UPI payment failures as consequential for the vendors and drivers receiving payment, and whether customers have directly observed distress resulting from such failures. Two indicators are presented: respondents' belief regarding the effect of a failed payment on the vendor or driver's livelihood, and respondents' direct observation of visible frustration or worry among vendors, drivers, or shopkeepers following a failed payment.

Data:-

As shown in Figure 5, 80.4 per cent of respondents believed that a failed UPI payment affects the livelihood of the vendor or driver, either definitely (26.8 per cent) or to some extent (53.6 per cent). Separately, 87.5 per cent of respondents reported having personally witnessed a vendor, driver, or shopkeeper appear visibly frustrated or worried because of a failed UPI payment, with 21.4 per cent reporting this occurred often and 66.1 per cent reporting it occurred a few times.

Table 12: Externality Awareness

Indicator	Category	Percentage
Belief that failure affects vendor livelihood	Definitely	26.8%
	To some extent	53.6%
Personally witnessed vendor distress	Often	21.4%
	A few times	66.1%

Interpretation:-

These findings indicate that customer awareness of the consequences of payment failure extends beyond their own transactional inconvenience. A majority of respondents recognise a potential effect on vendor or driver livelihood, and a comparably large majority have directly observed emotional or practical distress associated with a failed payment. The consistency between perceived impact and directly witnessed impact indicates that this awareness is grounded in observed experience rather than assumption alone.

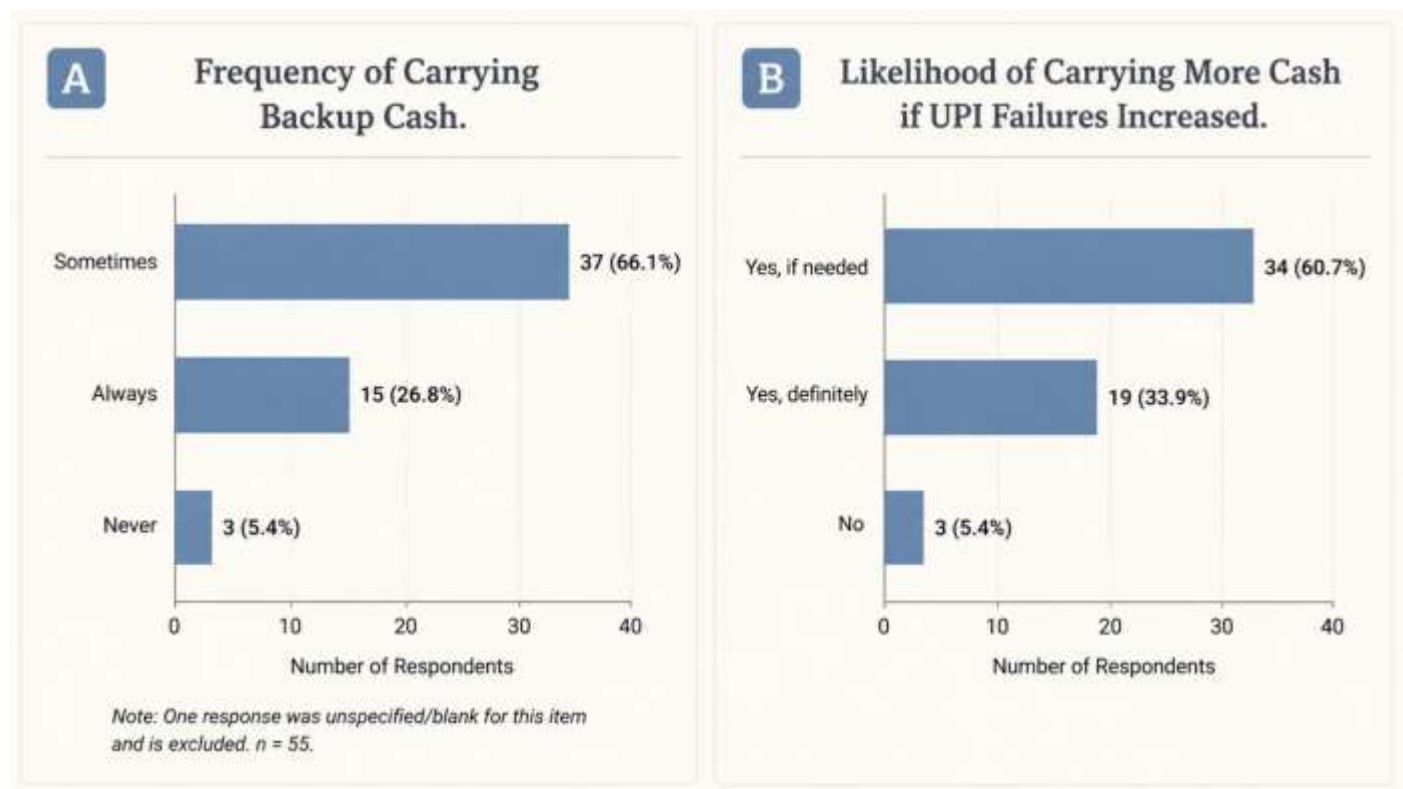
Precautionary Cash-Holding Behaviour:-

Figure 6: Precautionary Cash-Holding Behaviour and Responses to Increased UPI Payment Failures

Overview:-

This section examines whether customers maintain cash as a precautionary measure against UPI payment failure, and whether their cash-carrying behaviour would change if such failures became more frequent. Two indicators are presented: respondents' current habit of carrying backup cash, and their stated response to a hypothetical increase in UPI failure rates.

Data:-

As shown in Figure 6, 94.6 per cent of respondents reported carrying backup cash either always (27.3 per cent) or sometimes (67.3 per cent), with only 5.4 per cent reporting that they never do so. Separately, 94.6 per cent of

respondents indicated that they would be more likely to carry cash if UPI failures became more common, either definitely (33.9 per cent) or if needed (60.7 per cent), while 5.4 per cent indicated they would not.

Table 13: Precautionary Cash-Holding

Indicator	Category	Percentage
Carries backup cash	Always	27.3%
	Sometimes	67.3%
	Never	5.4%
Would carry more cash if failures increased	Definitely	33.9%
	If needed	60.7%
	No	5.4%

Respondents who experienced a recent failure were somewhat more likely to carry backup cash at least sometimes than those who had not (95.1% versus 86.6%), a modest difference that suggests precautionary cash-holding is only partially explained by recent failure experience and may also reflect a more general, pre-existing caution among UPI users.

Table 14: Payment Failure × Backup Cash Habit

	Always	Sometimes	Never
Failed recently (n=41)	10 (24.4%)	29 (70.7%)	1 (2.4%)
No recent failure (n=15)	5 (33.3%)	8 (53.3%)	2 (13.3%)

Interpretation:-

These findings indicate that a substantial majority of customers maintain cash as a precautionary measure alongside their use of UPI, rather than relying on digital payment. The majority's willingness to carry more cash when UPI becomes less reliable suggests that this precautionary behaviour is a response to perceived risk rather than a fixed habit independent of payment system performance.

Integration of Qualitative and Quantitative Findings:-

Across these five sections, a fairly consistent picture of customer behaviour emerges. UPI has become the default way most customers pay for everyday purchases, not just a convenient option they use occasionally. Given how central it is to their daily transactions, it is not surprising that failures, even when infrequent, are common enough that most customers have run into one. What stands out is how customers deal with these failures. They do not simply give up or lose trust in UPI. Instead, they fall back on a mix of solutions: cash on hand, retrying the payment, switching to another app, or, in a good number of cases, simply asking the vendor to trust them and pay later. That last option says something interesting: even in a digital-first transaction, an old-fashioned, informal understanding between two people is still doing real work when the system fails.

Customers also aren't just focused on their own inconvenience. A large majority believe failed payments hurt the vendor more than they hurt the customer, and even more have actually seen a vendor look frustrated or worried because of it. This shows customers are somewhat aware that a failed payment on their end isn't a neutral event; it has a cost for the person on the other side of the transaction. And this awareness shows up in how customers prepare for the possibility of failure too: nearly everyone keeps some cash on hand just in case, and almost the same number said they would keep even more cash if failures became more frequent. So while UPI is clearly preferred, customers are not fully betting on it working every time.

Connecting to the Vendor Perspective:-

The patterns visible in the customer data align with what the vendor findings described earlier. Vendors reported real disruption from payment failures, and customers, independently, notice that same disruption and its effect on the people they are paying; a large majority believe failed payments affect vendors' livelihoods, and most have personally witnessed a vendor look frustrated or worried because of one. This awareness also shapes how customers behave when a payment fails. Rather than delaying or abandoning the transaction, most customers switched to cash so the vendor still got paid, and nearly all said they carry backup cash for exactly this kind of situation. In practice, vendors already accommodate customers by accepting UPI despite the disruptions it causes them, absorbing failed or delayed transactions and, in some cases, extending trust-based payment to keep the sale going. Customer data

suggests flexibility is mutual: when UPI fails, customers often carry cash as a fallback to ensure transactions go through.

Table 15: Integration of Vendor and Customer Findings

Theme	Vendor Findings	Customer Findings	Combined Interpretation
Payment failure	Vendors report failed or delayed transactions disrupting operations	73.2% of customers experienced a failure or delay in the last 30 days	Payment reliability is a shared concern on both sides of the same transaction
Cash fallback	Some vendors prefer cash due to settlement risk	58.9% of customers pay with cash when UPI fails	Cash continues to function as a mutual backup mechanism rather than a fully replaced method
Liquidity	Vendors report difficulty accessing funds in time for restocking	80.4% of customers report a failure has stopped a purchase outright	Payment delays may have operational implications extending beyond the immediate transaction
Trust	Vendors sometimes extend trust-based, deferred payment to keep a sale going	30.4% of customers have asked to pay later on trust when a payment failed	Informal trust arrangements appear on both sides when the formal payment system fails

Discussion:-

The findings of this study suggest that the effectiveness of UPI adoption among informal vendors should not be assessed only through transaction volume or the number of merchants accepting digital payments. What the vendor and customer evidence in this study points to instead is that usability, and specifically whether earned funds are actually available when a vendor needs them, matters as much as whether a transaction was recorded as successful. This connects directly with the distinction between income and liquidity introduced earlier in this paper: a completed UPI transaction and usable cash in hand are not the same condition, and the gap between them is where much of the disruption documented in this study's fieldwork occurs.

Liquidity:-

The vendor interviews in this study repeatedly show that liquidity, not income, is closely associated with whether a payment failure becomes a minor inconvenience or an operational crisis. The vegetable vendor's account of a failed transaction preventing a scheduled wholesaler payment, and the fruit seller's description of needing same-day cash specifically to avoid settlement delay, both illustrate the same underlying constraint described by Collins et al. and Roever: informal vendors operate without savings buffers or institutional reserves, which makes each day's earnings the primary source of funding for the next day's operations. The customer-side data reinforces this from the other end of the same transaction. Respondents who experienced a recent payment failure were considerably more likely to report having had a purchase interrupted at some point than those who had not, suggesting that liquidity disruption is not an isolated event but tends to compound with repeated exposure. The RBI's own turnaround-time framework acknowledges that settlement delay is a recognised feature of digital payments, yet, as this study's fieldwork suggests, a delay window considered acceptable at the system level may still be operationally significant for a vendor whose next purchase depends on same-day access to funds.

Reliability:-

The customer survey data indicates that payment failure is a common rather than exceptional experience, with a majority of respondents reporting at least one failure or delay within the preceding month, and a large majority reporting that a failure had, at some point, prevented a purchase from being completed. This is consistent with what the vendor interviews describe at the point of sale. The elderly vendor's and flower vendor's accounts both suggest that unreliability is experienced most acutely by vendors with lower digital familiarity, who reported greater difficulty resolving a failed transaction once it occurred. Read alongside NPCI's own transaction-level data, which indicates that even a small percentage of technical failures translates into a substantial absolute number of failed transactions given UPI's transaction volume, this pattern suggests that reliability concerns are unlikely to disappear as adoption rates rise further. Encouragingly, the customer data also shows that heavier UPI users were somewhat more likely to report a recent failure than lighter users, which may reflect greater transaction volume rather than any

inherent unreliability tied to usage itself, a distinction worth noting given this study's cautious approach to causal claims.

Trust and Fraud:-

Fraud emerges in this study's fieldwork not primarily as a technical failure but as a breakdown of trust at the moment of payment confirmation. The vegetable vendor's account of losing produce worth eight thousand rupees to a fabricated payment screenshot, and the elderly vendor's repeated experience of similar scams, both illustrate the mechanism described in recent literature on UPI fraud: that offenders tend to exploit the ambiguity and urgency surrounding a transaction's confirmation status rather than any deep technical vulnerability in the payment system itself. Customer awareness data lends further weight to this pattern. A large majority of customers believe that a failed payment affects a vendor's livelihood, and a comparable majority report having personally witnessed a vendor appear visibly frustrated or worried following a failed payment. This alignment between vendor-reported fraud experience and customer-observed distress suggests that the trust deficit documented in this study is visible from both sides of the transaction, not only to the vendor absorbing the loss.

Implications:-

Taken together, these three themes point to a common conclusion: liquidity, reliability, and trust are not peripheral to UPI adoption but central to how vendors experience its use. A vendor may qualify as a UPI user by adoption metrics while simultaneously reporting repeated, uncompensated disruption to daily operations. This disparity constitutes the reliability gap examined in this study, which transaction-level adoption statistics cannot capture. The policy recommendations that follow are therefore structured around this gap, addressing liquidity through payment-status transparency, reliability through vendor-oriented system design, and trust through stronger fraud verification and a dedicated grievance pathway.

Policy Recommendations: Closing the Reliability Gap:-

This study shows that UPI adoption alone does not ensure a reliable payment experience for informal vendors. To address key fieldwork gaps, policy must move beyond adoption metrics and focus on the specific needs identified through vendor and customer evidence: dependable access to funds, interfaces designed for vendor realities, protection against fraud, and grievance frameworks tailored to their distinct operational model.

Payment-Status Transparency:-

The most immediate policy priority is to address the liquidity strain that payment failures impose on vendors' daily operations. Operating on tight daily cash cycles, informal vendors face immediate operational disruptions when a UPI transaction fails or stalls, often rendering them unable to procure inventory for the next day. A Merchant Payment Tracking System could be introduced for registered informal and semi-formal vendors, allowing them to track the real-time status of small-value UPI transactions and clearly distinguish between successful, failed, and pending payments. Where a transaction remains pending, the system could provide an expected resolution or availability window, giving vendors greater certainty over when they can rely on the funds. For vendors, this replaces uncertainty with clear information right when they need it, allowing them to decide immediately whether to trust a pending payment or ask for a different payment method.

Vendor-Oriented Payment Systems:-

Beyond status visibility, payment systems themselves need to recognise that informal vendors' liquidity needs differ structurally from those of individual retail customers or formal businesses. If a payment remains unresolved beyond a defined threshold and the vendor cannot wait due to immediate business needs, the system could clearly indicate that the payment should not yet be treated as received, allowing the vendor to request an alternative payment method from the customer. Such a mechanism would require no new infrastructure investment from vendors themselves, only procedural and system-level changes by banks and payment service providers to improve transparency, predictability, and control over payment-related liquidity. This directly protects vendors' ability to buy daily stock and keep their business running, addressing a major reason many still prefer cash.

Fraud Protection:-

A recurring pattern in this study's fieldwork, most clearly illustrated by vendors who described being shown fabricated payment screenshots, is that fraud in this context often exploits the moment of payment confirmation itself rather than any deeper technical vulnerability. Verification mechanisms need to give vendors a way to confirm that a payment has genuinely gone through, independent of what a customer's phone screen shows them. This could take the form of an independent confirmation channel, such as an audible or visual notification generated directly by

the vendor's own banking app rather than relying on a customer-facing screenshot as proof of payment. Strengthening this layer of verification directly protects vendors from the kind of loss described in this study's fieldwork, where confirmation was assumed rather than independently checked.

Digital Literacy:-

A significant share of payment-related difficulty among vendors stems not from the payment infrastructure itself but from vendors' unfamiliarity with it. Many vendors interviewed for this study had adopted UPI functionally, in that they could receive payments, but remained uncertain about how to interpret confirmation screens, identify failed or fraudulent transactions, or resolve errors without assistance. A simplified UPI interface designed specifically for informal vendors, featuring fewer buttons, clear navigation, larger confirmations, and local language options, would enable vendors to handle transactions without navigating complex consumer features. Alongside this, simple training covering how to check payment status, identify fake screenshots, handle failed transactions, and raise complaints would give vendors the practical skills the interface alone cannot teach. An embedded local-language AI assistant and a toll-free helpline could support this training on an ongoing basis, offering guidance as new features launch rather than as a one-time session.

Faster Grievance Resolution:-

The existing grievance redressal and compensation framework for failed or disputed digital transactions, including the RBI's circular on turnaround time and customer compensation, was designed primarily with individual retail customers in mind. This framework assumes vendors have detailed paperwork, formal banking knowledge, and extra time to file complaints, resources that most informal vendors do not have. A Vendor Payment Dispute Resolution Framework could be introduced within the existing regulatory framework, distinct from the general customer-facing process, allowing registered informal and semi-formal vendors to report disputed or fraudulent transactions through a simplified process. This framework could include shorter resolution timelines for small-value transactions, given that vendors' liquidity needs are often more immediate than those of individual consumers, as well as a lower evidentiary burden for filing a complaint, relying on transaction IDs and basic payment-app records rather than extensive documentation.

Reliability as a Policy Indicator:-

Taken together, these recommendations point to a single underlying shift: policy attention needs to move from whether vendors have adopted UPI to whether UPI actually works for them once adopted. Digital-payment success should be evaluated not only by adoption and transaction volume, but also by reliability and usability for merchants specifically, since these are the dimensions this study's fieldwork suggests aggregate adoption statistics do not capture. None of these recommendations ask vendors to change how they operate. Instead, they ask the payment system to be built around how informal vendors actually work, rather than expecting vendors to adjust to a system designed without them in mind.

Limitations of the Study:-

This study has several limitations that should be considered when interpreting its findings. The vendor and customer samples were both relatively small, comprising 55 vendors and 56 customer respondents, and both were drawn using convenience sampling rather than random or stratified selection. As a result, each sample reflects who was available and willing to participate during the fieldwork period rather than a representative cross-section of informal vendors or UPI users more broadly. The study is also geographically limited to a single market, Mira-Bhayander Market, and the vendor fieldwork itself was conducted over four days, which constrains the extent to which seasonal variation, longer-term payment behaviour, or market-specific dynamics could be captured. A substantial portion of the findings rely on self-reported information from vendors and customers, including recollections of past payment failures, fraud incidents, and financial loss, which were not independently verified against transaction records. The customer survey was conducted entirely through an online Google Forms questionnaire, which may have excluded customers without smartphone access or comfort with digital forms, potentially skewing the customer sample toward more digitally engaged respondents. Given these constraints, the findings presented in this study should not be generalised to all Indian informal vendors or UPI users, and are better understood as indicative of patterns within the specific population and context studied. Finally, while this study identifies recurring patterns and associations between UPI adoption, payment failure, and vendor or customer behaviour, its cross-sectional design and non-random sampling mean it does not establish causal relationships between these variables, and all interpretations offered in this paper should be read accordingly.

Conclusion:-

A vendor who accepts UPI is not necessarily a vendor who can reliably depend on it. National adoption statistics do not capture this distinction. This study therefore examines what such measures leave unseen: how payment unreliability affects the liquidity and operational capacity of informal vendors. Fieldwork at Mira-Bhayander Market, covering roadside vendors, food van owners, and small shop owners, indicates that the reliability gap is not reducible to individual preference. Its effects vary with vendors' liquidity requirements, business models, and capacity to absorb disruption. The vendor-side findings indicate six distinct mechanisms through which payment-related difficulties can generate operational strain: liquidity access, supply-chain timing, institutional friction, technical unfamiliarity, fraud-driven loss, and settlement costs. These mechanisms are unevenly distributed across vendors. Importantly, digital capability and payment preference are not equivalent. While digital familiarity affects a vendor's ability to use UPI, it does not necessarily determine whether UPI is preferred. Several vendors expressed a preference for cash despite being capable UPI users, suggesting that payment preferences are shaped more strongly by operational requirements and exposure to risk than by technical proficiency alone. The customer-side findings further complicate this relationship. Customers appear to respond to payment uncertainty by carrying cash as a precaution against transaction failure. However, their exposure to this risk differs fundamentally from that of vendors. Customers can adopt or discontinue such precautions, whereas vendors bear the operational consequences of failed or delayed transactions, including settlement uncertainty, disputed payments, and losses arising from fraud. In the absence of protections comparable to those available to larger retailers, informal vendors may consequently rely on interpersonal trust to compensate for limitations in payment infrastructure.

The conceptual framework developed from Collins et al. and Roever, alongside the RBI's turnaround-time framework, helps situate these findings within broader patterns of informal liquidity management. Liquidity continues to be managed through informal relationships even as formal digital instruments increasingly mediate transactions. At the same time, formal mechanisms for resolving failed payments do not necessarily account for the immediate operational consequences experienced by small vendors. The central finding is therefore not merely that digital payments can fail, but that such failures appear associated with a redistribution of operational and financial risk in ways that remain invisible within aggregate adoption measures. This study does not challenge the expansion of UPI; rather, it demonstrates that adoption is an incomplete measure of effective and reliable use. The policy recommendations, particularly those concerning payment-status transparency and fraud verification, follow directly from this distinction between adoption and reliability.

These findings are based on a small, single-market sample and should therefore be interpreted as indicative rather than nationally generalisable. Within the scope of the study, however, the evidence suggests that the reliability gap represents not only a technical limitation but also a redistribution of risk that informal vendors frequently appear to absorb through their own liquidity, relationships, and operational flexibility.

Bibliography:-

1. Collins, D., Morduch, J., Rutherford, S., & Ruthven, O. (2009). *Portfolios of the Poor: How the World's Poor Live on \$2 a Day*. Princeton, NJ: Princeton University Press.
2. Roever, S. (2014). *Informal Economy Monitoring Study Sector Report: Street Vendors*. Cambridge, MA: WIEGO.
3. Reserve Bank of India. (2019). *Harmonisation of Turn Around Time (TAT) and Customer Compensation for Failed Transactions Using Authorised Payment Systems*.
4. Reserve Bank of India. (2025). *Annual Report 2024–25*. Mumbai: RBI.
5. Reserve Bank of India, Department of Payment and Settlement Systems. (2022). *Payments Vision 2025*. Mumbai: RBI.
6. Government of India, Ministry of Housing and Urban Affairs. (2020). *Pradhan Mantri Street Vendor's AtmaNirbhar Nidhi (PM SVANidhi) Scheme*. Launched June 1, 2020.
7. Worldline India. (2026). *India Digital Payments Report – Year 2025 in Review*. Mumbai: Worldline.
8. National Payments Corporation of India. (2022). *UPI Operating Circular OC-149: Reduction of Business Declines in UPI*. Mumbai: NPCI.
9. National Payments Corporation of India. (2025). *UPI Ecosystem Statistics: Business Decline and Technical Decline (BD/TD) Data*. Mumbai: NPCI.
10. Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19*. Washington, DC: World Bank.
11. Yadav, C. (2022, February 28). *Street vendors: Policy support to aid the recovery of the heart of India's retail market*. IIM Bangalore Perspectives.

12. National Sample Survey Organisation. (2012). 67th Round Survey on Employment and Unemployment. Ministry of Statistics and Programme Implementation, Government of India.
13. International Labour Organization & Institute for Human Development. (2024). India Employment Report 2024: Youth Employment, Education and Skills. New Delhi: ILO/IHD.
14. Reserve Bank of India. (2020). Online Dispute Resolution (ODR) System for Digital Payments (Circular dated August 6, 2020). Mumbai: RBI.
15. Motheram, A., & Buteau, S. (2026). Supply side drivers of digital payment adoption in India. *Discover Sustainability*, 7(1), 560.
16. Kukreti, A., Kuniyal, B., & Wadhera, G. (2025). Report on Adoption of UPI Among Street Vendors: Drivers and Barriers in Delhi NCR. Krishna Raj Travel Fellowship.
17. Naik, S. G., & Shetty, R. (2025). A study on impact of UPI digital payment platforms on the financial inclusion of street vendors in urban India. *EPRA International Journal of Multidisciplinary Research*, 11(6), 1979–1987.
18. Mukhopadhyay, N., & Mukhopadhyay, M. (2024). UPI Frauds: A Study on UPI Usage, Awareness and Impact in India. *International Journal of Research in Commerce and Management Studies*, 6(6), 179–197.
19. Sharma, A., & Singh, Y. (2024). Cyber Frauds in India's Digital Payment Ecosystem: Risk, Impacts, and Regulatory Responses. *Educational Administration: Theory and Practice*, 30(5), 15326–15332.