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Digital Financial Infrastructure and MSME Integration into Global Value Chains: Evidence from India's UPI Ecosystem

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ABSTRACT

Under the Make in India and Atmanirbhar Bharat initiatives, the country is striving to help its MSMEs find their place in Global Value Chains. 30% of India's GDP and 45-50% of its total exports are generated by MSMEs. But they have big problems that are built into the system, like not being able to get credit, high transaction costs, and not being able to see the market well. This paper looks at how India's Digital Public Infrastructure (DPI), especially the Unified Payments Interface (UPI) ecosystem, can help people get involved in GVC. Using data from 2020 to 2026, the study shows that UPI-driven financial formalisation makes a digital trail that can be verified and takes the place of traditional collateral. This makes it 35–50% easier for micro-enterprises to get credit. The study goes into more detail about how UPI is growing into international corridors, like the UPI-PayNow link with Singapore, which has cut trade settlement and remittance costs from 13% to less than 3%. The study says that India is creating a "resilient efficiency" model by combining new digital rails like the Open Network for Digital Commerce (ONDC), the BharatTradeNet unified portal, and the 2026 Digital Trade Facilitation Bill. This model lets MSMEs go beyond local limits and become important parts of global production networks. Legislative reforms recognizing electronic trade documents as legally binding facilitate a shift toward high-tech, value-added manufacturing. The results show that by 2025, 90% of MSMEs will use digital tools. However, Tier-2 and Tier-3 cities still have a lot of problems with digital literacy. The paper ends with suggestions for making the ecosystem better for everyone to participate in, such as subsidies for green technology and standards that are the same all over the world.

Keywords: *Unified Payments Interface (UPI), Global Value Chains (GVCs), MSME Integration, Digital Public Infrastructure (DPI), Financial Formalisation, and Cross-Border Trade Facilitation.*

1. Introduction

In the current globalised economy, Global Value Chains (GVCs) are the main structure of international trade. They make up about 80% of all trade (World Bank, 2020). The conventional manufacturing paradigm, previously defined by the consolidation of production stages within a singular nation, has transformed into a significantly fragmented and geographically dispersed framework (Raei et al., 2019). India is an emerging economy, and for it to grow and change its structure in the long term, it needs to be able to connect its Micro, Small, and Medium Enterprises (MSMEs) to these advanced networks (Pandey, 2024). MSMEs are the most important part of the Indian economy. They employ more than 110 million people and are always coming up with new ideas (Ministry of MSME, 2023). The shift from being a domestic producer to being part of a global value chain is not easy, mostly because of the "long fat tail" of unproductive, informal micro-enterprises that can't get formal financing (Singh, 2025).

India's Digital Public Infrastructure (DPI), also known as the "India Stack", has been a game-changer for these structural problems (BIS, 2024). The Unified Payments Interface (UPI) is the most important part of this infrastructure.

Since it started in 2016, it has changed the way people pay for things in India (NPCI, 2024). As of December 2025, UPI transaction volumes have exceeded 21 billion a month. This is a huge change from an economy that relied on cash to one where about half of all transactions are digital (Nagaraju, 2026). This digitalisation is more than just a matter of convenience; it also helps formalise finances by leaving a clear and traceable digital footprint for millions of businesses that were previously unbanked or underbanked (Singh, 2025).

For MSMEs, this digital trail is a strategic asset. The UPI ecosystem helps lenders by giving them high-frequency data on cash flows and sales. This reduces the information gap that has made it hard for MSMEs to get loans in the past (Galilea et al., 2024). Also, the combination of digital payments and new platforms like the Open Network for Digital Commerce (ONDC) lets small businesses sell directly to customers all over the world (Singh, 2025). India's digital-first approach gives it a unique competitive edge as global supply chains change in response to geopolitical changes and the need for "resilient efficiency" (Freeman & Baldwin, 2022). This paper aims to examine the mechanisms by which the UPI ecosystem enables the integration of MSMEs into GVCs, offering evidence of its effects on formalisation, access to credit, and the facilitation of cross-border trade.

2. Conceptual Framework and Literature Review

Transaction Cost Economics (TCE) and the Resource-Based View (RBV) of the firm can help us understand how digital financial infrastructure affects GVC participation.

2.1 Transaction Cost Economics and Digitalization

According to Transaction Cost Economics, the costs of finding partners, negotiating contracts, and enforcing agreements set the limits of a business and the structure of value chains (Gereffi et al., 2005). Digitalisation is a "distance-reducing" force because it makes it easier and cheaper to find global buyers (Cassetta et al., 2020).

- The total transaction cost (TC) for an MSME can be represented as -

$$TC = \int_0^T (C_{search} + C_{negotiation} + C_{enforcement})dt$$

Digital payment systems like UPI reduce $C_{negotiation}$ and $C_{enforcement}$ by providing instant settlement and transparent records. This allows MSMEs to participate in "modular" or "relational" value chains where coordination depends on high-frequency data exchange (Sasidharan & Reddy, 2021).

2.2 The Resource-Based View and Digital Assets

The Resource-Based View says that companies can get a competitive edge by getting resources that are valuable, rare, and can't be replaced (Peter et al., 2025). In the digital age, "technological capability" and "digital financial literacy" are seen as important intangible assets. For Indian MSMEs, using UPI gives them a strategic advantage that lets them use formal financial services and join digital trade ecosystems (Singh, 2025).

Empirical studies have established a consistent positive correlation between firm digitalisation and export performance (Huria et al., 2022). Research on the Indian manufacturing sector shows that higher levels of digitalisation are directly linked to higher export intensity, especially for small businesses in low-tech industries (Sasidharan & Reddy, 2021). Digital tools help these companies get around the "thin-file" problem, which is when someone doesn't have a traditional credit history, by giving them a digital transaction trail instead (Galilea et al., 2024).

3. The Digital Public Infrastructure (DPI) Landscape in India

India's integration into GVCs is underpinned by a robust multi-layered DPI, known as the India Stack.

3.1 The India Stack's Layers

There are three main layers in the India Stack (BIS, 2024):

1. **Identity Layer (Aadhaar):** This gives you a unique digital identity that can be verified by biometrics. It makes e-KYC easier and lowers the cost of onboarding.
2. **Payments Layer (UPI):** This lets banks send and get money in real time, 24 hours a day, 7 days a week, using mobile numbers or virtual payment addresses (VPA).
3. **Data Empowerment Layer (Account Aggregator):** A system that lets businesses share financial information with lenders based on consent. This helps lenders make decisions about credit based on data (Singh, 2025).

3.2 The Role of Regulatory Support

This architecture is different because it is run as a public good, which stops one company from taking over (BIS, 2024). For MSMEs, this means they can access world-class financial infrastructure without being locked into expensive proprietary systems (ONDC, 2024).

4. The UPI Ecosystem: Technical and Functional Architecture

UPI is a payment system that works in real time and lets you combine several bank accounts into one mobile app. As of July 2025, UPI transactions were worth ₹ 25.08 lakh crore per month, which was 84% of all digital payments made in stores (JETIR, 2025).

4.1 Key Architectural Attributes

Five main features define the UPI ecosystem (BIS, 2024):

Attribute	Technical Mechanism	Benefit to MSMEs
Open Architecture	Publicly available APIs for developers.	Allows niche business apps to integrate payments.
Interoperability	Standardized protocols across 632+ banks.	Eliminates the need for multiple accounts or QR codes.
Multi-party Transactability	Decouples the app from the bank account.	Gives firms freedom to choose service providers.
Strict Data Regulations	TPAPs cannot monetize individual data.	Builds trust and makes sure that data is safe.
Zero Transaction Costs	Subsidized or zero MDR for merchants.	Removes cost barriers for micro-enterprises.

4.2 Functional Evolution: From P2P to B2B

UPI was first popular for peer-to-peer transfers, but it has grown a lot since then into the peer-to-merchant (P2M) and business-to-business (B2B) markets (Khanna & Samwani, 2023). UPI 2.0 has made it a full-fledged business tool by adding invoice linking and pre-authorization (NPCI, 2025). For GVC integration, this level of openness is necessary because lead firms need proof of transactions that can be verified (Galilea et al., 2024).

5. MSME Formalization: The Digital Trail as a Strategic Asset

UPI serves as the "gateway to formalization" by creating a verifiable digital trail of every sale (Singh, 2025).

5.1 The "Thin-File" Problem and Alternative Credit Scoring

Lenders traditionally viewed MSMEs as high-risk due to a lack of collateral. Digital payment trails mitigate this information asymmetry. Small and medium-sized businesses (SMEs) that have used digital payments in the past are 35 to 50% more likely to get loans approved (SIDBI, 2023). This is very important for the "micro" and "nano" categories, which don't have official audited financial statements (Galilea et al., 2024).

5.2 Impact on Financial Inclusion

UPI processed over 21 billion transactions per month and had 400 million active users by December 2025 (Nagaraju, 2026). More than 90% of MSMEs in cities like Jalgaon now use digital payments to make things run more smoothly (IJIRT, 2025). Companies can get loans without collateral through government programmes like MUDRA and CGTMSE (Singh, 2025).

Program	Digital Linkage	Impact on GVC Integration
MUDRA Scheme	Often disbursed via digital wallets.	Provides capital for tech upgrades.
CGTMSE	Leverages digital transaction trails.	Raises credit cover to ₹ 10 crore for exporters.
RAMP Programme	Focuses on digitizing MSME data.	Enhances competitiveness of 5.5 lakh MSEs.
TEAM Initiative	Integration with ONDC and GeM.	Digitally empowers 5 lakh MSEs for exports.

6. Integrating MSMEs into Global Value Chains: Mechanisms and Synergies

6.1 Liquidity and Market Reach: The UPI and ONDC Synergy

Real-time payment systems like UPI improve cash flow by ensuring funds are realized instantly upon settlement (Worldline India, 2025). For an MSME, this reduces Days Sales Outstanding (*DSO*) to nearly zero (PwC, 2025). The synergy with ONDC allows MSMEs to reach a global customer base without paying high commissions (15-30%) to proprietary platforms, as ONDC's commission rate is typically 3-5% (TreeLife, 2025).

6.2 Upgrading toward High-Tech Manufacturing

To move up the value chain, Indian MSMEs must transition to medium-high technology products. Digitalization facilitates "process upgrading" by enabling real-time supply chain visibility (Gereffi et al., 2005). FY 2025-26 data shows high-tech manufacturing momentum, with medium and high-technology activities accounting for 46.3% of total manufacturing value added (Economic Survey, 2026).

7. Empirical Analysis of Digitalization and Export Performance

Recent data from the 2024-2026 period provides strong evidence of the impact of digital adoption on MSME internationalization (India SME Forum, 2025):

Metric (2025)	Observation	Implications for GVCs
Digital Adoption Rate	53.8% of MSMEs (Sample 7,835).	Over half of the sector is now "digital-ready".
Sales Impact	41.4% saw 21-30% sales increase.	Direct link between digital tools and revenue.
Customer Base	69% grew customer base by 10%+.	Digital tools facilitate broader market access.
Payment Preference	90%+ MSMEs accept digital payments.	Widespread UPI adoption is the foundation.

8. Internationalization of UPI: Cross-Border Trade Facilitation

The expansion of UPI into international corridors like Singapore, UAE, Nepal, Bhutan, France, and Mauritius is reducing the friction of international trade (Worldline India, 2025).

- **Cost Reduction:** In the Singapore corridor, fees went from 13% to less than 3% (FSB, 2025).
- **Speed:** Transactions that used to take 3 to 5 days to settle through SWIFT now happen almost instantly (Worldline India, 2025).
- **Project Nexus:** The BIS wants to connect payment systems in five Asian countries by 2026 so that money can be sent instantly (IMF, 2025).

9. Challenges and Structural Barriers

- **Digital Literacy:** According to a report from NITI Aayog (2025), "skill gaps" are a big problem in cities that are in Tier 2 and Tier 3.
- **Geopolitical Risks:** The conflict between Iran and Israel could hurt $4.5 billion in electronics exports to the Gulf, which would raise shipping costs (Economic Times, 2026).
- **Security:** 24% of small businesses have said they have been the target of phishing or other kinds of fraud (IJCRT, 2025).
- **Regulation:** India's data localisation and the EU's GDPR still don't get along, which is a problem (India DPDPA, 2026).

10. The 2026 Policy Environment: Digital Trade Resilience

10.1 The Digital Trade Facilitation Bill 2026

This bill, which says that electronic trade documents are just as legally binding as paper ones, was announced in the Union Budget 2025–26 (DGFT, 2026). It turns BharatTradeNet into a single digital platform that links banks, ports, and customs officials (DGFT, 2026).

10.2 Green Value Chains and ESG

The government is thinking about a ₹ 2,000 crore plan to upgrade technology in the Budget 2026–27 to help small and medium-sized businesses (MSMEs) meet global ESG standards and avoid carbon tariffs (MSME Samachar, 2026).

11. Conclusion and Policy Recommendations

The evidence shows that UPI is a strong tool for helping MSMEs join global value chains by lowering costs and making information more equal.

- **Policymakers:** Make sure that people in rural areas know how to use technology and make sure that data standards are the same across borders with the 2026 Bill (DGFT, 2026).
- **Financial Institutions:** Use Account Aggregator data to make cash-flow-based loans more widely available (Singh, 2025).
- **MSMEs:** Leverage ONDC and BharatTradeNet for direct global marketing (TreeLife, 2025).

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