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DIGITAL PAYMENT SYSTEMS AND THEIR ROLE IN FINANCIAL INCLUSION: A SPECIAL REFERENCE TO ODISHA

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ABSTRACT

Economic development poverty alleviation and social empowerment are all significantly influenced by financial inclusion which is defined as providing low-income and disadvantaged elements of society with accessible and cheap financial services. Geographical societal and infrastructure hurdles contribute to the deep financial inclusion gap that still exists in the Indian setting despite major governmental measures. A revolutionary chance to close this gap is provided by the emergence of digital payment systems (DPS) which were sparked by the India Stack (Aadhaar UPI and Digital Locker). With an emphasis on the state of Odisha this study examines how digital payment systems promote financial inclusion. Odisha offers a distinctive and important case study because of its difficult topography sizable tribal population agrarian economy and susceptibility to natural calamities. The study uses a mixed-methods approach reviewing existing literature and policy documents in addition to analyzing secondary data from reports by the Reserve Bank of India (RBI) National Payments Corporation of India (NPCI) National Family Health Survey (NFHS) and the State Level Bankers' Committee (SLBC) Odisha. In order to organize the analysis, it first establishes the theoretical and worldwide background of digital financial inclusion. After that it explores Odisha's financial and socioeconomic environment emphasizing its unique difficulties. The main focus of the study looks at how important DPS tools such the Pradhan Mantri Jan Dhan Yojana (PMJDY) Aadhaar-enabled Payment Systems (AePS) Unified Payments Interface (UPI) and micro-ATM networks have spread throughout the state. The analysis shows that although Odisha's digital payment infrastructure has grown significantly due to government transfers (DBT) it uses for active transactional financial participation is still in its infancy. Digital illiteracy language difficulties poor last-mile connectivity gendered access inequities and a lack of trust especially in remote and tribal communities are persistent challenges. The study comes to the conclusion that while digital payment systems are a prerequisite for comprehensive financial inclusion in Odisha, they are not adequate. It suggests a multifaceted approach that emphasizes strong digital literacy initiatives in regional languages gender-sensitive product design bolstering digital and physical infrastructure simultaneously encouraging use-cases outside of DBT and creating a trust-building regulatory environment. For similar regional economies throughout India and the developing globe the Odisha example provides important insights for



creating context-sensitive digital financial inclusion programs.

KEYWORDS: Financial Inclusion Digital Payment Systems Unified Payments Interface (UPI) Digital India Tribal Economy Digital Divide Aadhaar PMJDY.

1. INTRODUCTION

1.1 Background of the study

From being a peripheral social goal, financial inclusion has developed into a key component of both national and international economic strategy. People and households can manage cash flows, reduce risks, participate in opportunities, and avoid the clutches of predatory informal lenders by having access to a minimum range of financial services, including savings, credit insurance, and payments. The Sustainable Development Goals (SDGs) of the United Nations implicitly acknowledge financial inclusion as a means of attaining goals pertaining to economic growth (SDG 8), gender equality (SDG 5), poverty (SDG 1), and hunger (SDG 2). India has had a difficult and protracted path towards full financial inclusion. Important turning points included the nationalization of banks, the lead bank program, the development of Regional Rural Banks (RRBs), and the Self-Help Group (SHG)-Bank Linkage Program. But the pivotal moment came after 2014 when a technology framework (India Stack), a regulatory push (Jan Dhan Yojana), and a demonetization shock (2016) all worked together. The establishment of basic bank accounts and the uptake of digital payment methods saw an unparalleled pace during this time. Infrastructure and tools that facilitate financial transactions without the actual exchange of currency are referred to as digital payment systems (DPS). They include mobile banking, card-based systems (credit/debit), and more modern, cutting-edge platforms like the Unified Payments Interface (UPI). DPS has the ability to significantly reduce the cost of financial services, expand regional reach, and generate transactional data that can make credit more accessible. DPS are more than just payments when it comes to financial inclusion; they serve as the cornerstones around which a wider range of formal financial involvement can be constructed.

1.2 Why Odisha? The Significance of the Case Study

The state of Odisha in eastern India embodies both the enormous potential and the difficult obstacles of digital financial inclusion in a developing economy.

- **Infrastructure and geographic barriers:** Odisha have particular logistical problems for physical banking and digital connectivity because of its extensive coastline, hilly terrain, deep forests, and frequent cyclonic disturbances.

- **Demographic and Social Composition:** According to the 2011 Census, Odisha has one of the highest percentages of Scheduled Tribe (ST) people in all of India (22.85%). Due to their relative remoteness, unique languages, and disparate socioeconomic customs, many indigenous populations face particular obstacles to mainstream financial integration.



- **Economic Profile:** The state's economy is mostly based on agriculture and natural resources. Flexible and robust financial tools are necessary due to poverty, seasonal revenue flows, and a high prevalence of informal work.
- **Policy Context:** Through its own initiatives and in collaboration with the federal government, the state government has aggressively pushed financial inclusion. This dedication is demonstrated by the "Odisha Financial Inclusion Plan" and the "Ama Bank" (Our Bank) program for unbanked Gram Panchayats.
- **The Digital Leapfrog Potential:** Given the limitations of physical infrastructure, digital channels present Odisha with a way to overcome conventional banking obstacles. Millions of accounts and biometric authentication have already been seeded by the widespread implementation of Direct Benefit Transfer (DBT) for programs like KALIA (Krushak Assistance for Livelihood and Income Augmentation).

Studying the relationship between DPS and financial inclusion in Odisha is therefore a critical investigation into how digital finance may be adapted to intricate real-world contexts of marginalization rather than merely an analysis of a single state.

1.3 Research Objectives

This paper aims to:

- To Analyze the conceptual framework linking digital payment systems to broader financial inclusion outcomes.
- To Assess the current state of financial inclusion and digital payment adoption in Odisha using key metrics.
- To Identify the drivers (e.g., DBT UPI growth) and inhibitors (e.g. digital divide literacy) of DPS usage for financial inclusion in the state.
- To Evaluate the impact of specific DPS (AePS UPI Micro-ATMs) on different demographic segments particularly rural households' women and tribal communities.
- To find out the propose a strategic policy and implementation roadmap to enhance the role of DPS in achieving meaningful financial inclusion in Odisha.

1.4 Methodology and Sources

This is a descriptive and analytical research paper based primarily on secondary data. The methodology involves:

- **Literature Review:** Synthesizing academic papers reports from multilateral institutions (World Bank IMF) and think tanks on digital financial inclusion.
- **Data Analysis:** Collating and interpreting data from:
- **Regulatory Bodies:** RBI's Handbook of Statistics on Indian States Basic Statistical Returns.



- **Operational Entities:** NPCI data on UPI AePS and Bharat BillPay transactions.
- **Government Surveys:** NFHS-5 (2019-21) NABARD's All India Rural Financial Inclusion Survey (NAFIS) Economic Survey of Odisha.
- **State-Specific Reports:** SLBC Odisha reports Odisha Economic Survey government scheme data.
- **Case Study Analysis:** Incorporating documented case studies and field reports from Odisha on DPS implementation.

1.5 Structure of the Paper

The paper is organized as follows: Section 2 reviews the literature and theoretical underpinnings. Section 3 provides a profile of Odisha's socio-economic and financial landscape. Section 4 details the evolution and architecture of India's digital payment ecosystem. Section 5 presents a granular analysis of DPS penetration and usage in Odisha. Section 6 discusses the persistent challenges and barriers. Section 7 examines the gendered dimensions of inclusion. Section 8 explores forward-looking models and opportunities. Section 9 concludes with findings and recommendations.

2. Literature Review and Conceptual Framework

2.1 The Evolution of Financial Inclusion: From Access to Usage

Early research on financial inclusion associated it with account ownership and physical access locations, such as bank branches (Beck et al. 2007). However, a paradigm shift was brought about by the "underbanked" or "dormant accounts" issue. Demirgüç-Kunt et al. (2018) and other modern researchers highlight "meaningful" or "active" inclusion, which includes consistent use of accounts for payments, savings, and credit insurance. Understanding demand-side constraints including low income, illiteracy, and lack of trust has taken precedence over supply-side provisioning (Karlan et al. 2016).

2.2 Digital Financial Inclusion: A Paradigm Shift

As mobile phones became more common, the idea of Digital Financial Inclusion (DFI) was born. According to GPF (2016), it is described as "digital access to and use of formal financial services by excluded and underserved populations." The ability of digital technology to lower three important expenses provides the theoretical foundation (McKinsey 2016):

- **Service Delivery Cost:** Digital channels are less expensive than physical locations.
- **Cost of Customer Acquisition:** Digital onboarding and e-KYC reduce expenses.
- **Cost of Risk Management:** Alternative credit scoring is made possible by the digital footprints created by transaction data.

A straightforward mobile money system could boost household resilience savings and professional mobility, particularly for women, according to studies on M-Pesa in Kenya (Suri & Jack 2016).



2.3 The Indian Model: India Stack and the JAM Trinity

The "JAM" (Jan Dhan-Aadhaar-Mobile) Trinity and the India Stack form the foundation of the unique Indian approach to DFI (Mohan 2022).

- The account base (more than 500 million) was supplied by Jan Dhan.
- Mobile supplied the communication channel; Aadhaar offered a distinct biometric-based digital identity that made safe authentication and e-KYC possible.

A public digital infrastructure that promotes innovation is created by the layers of the India Stack: Presence less (Aadhaar), Paperless (e-KYC), Cashless (UPI), and Consent (Data Empowerment) (Rajan 2022). Research shows that this "public goods" strategy encourages interoperability, which is essential for inclusion, and avoids vendor lock-in (Gopalakrishnan 2021).

2.4 Digital Payments as a Gateway

According to research, digital payments are a gateway product rather than an end in and of themselves (BIS 2020). A digital transaction habit establishes a record, fosters familiarity with formal systems, and can serve as a springboard for obtaining credit (via transaction-history-based financing), insurance, and investment goods. However, academics like D'Silva et al. (2019) warn that in order to prevent exclusion, a "payments-first" strategy needs to be supplemented with financial education and pertinent product design.

2.5 Gaps in Literature and This Paper's Contribution

There is a comparatively little number of thorough state-level studies in the Indian context, particularly for complicated states like Odisha, despite the fact that there is a wealth of literature on digital payments at the national level and M-Pesa in India. The majority of assessments concentrate on either micro-level success stories or macro-level statistics. By offering a mid-level analysis that links national policy and technology with the grounded realities of a particular regional economy and looks at both aggregate trends and disaggregated difficulties, this article aims to close this gap. It advances knowledge of the relationship between deeply ingrained local socioeconomic institutions and universal digital infrastructure.

3. Odisha: A Socio-Economic and Financial Inclusion Profile

3.1 Demographic and Geographic Context

With more than 41 million people, Odisha is home to 62 different tribal communities. More than 83% of people live in rural areas. The state's topography includes a coastline that is vulnerable to cyclones, vast forest cover, and isolated hilly areas (like Kandhamal Rayagada). The construction of physical infrastructure, such as bank branches and roadways, has historically been hampered by this topography.

3.2 Key Socio-Economic Indicators

- **Poverty:** Compared to the national average of 25.01%, 29.35% of Odisha's population is multidimensionally poor, according to NITI Aayog's Multidimensional Poverty Index (MPI) 2021.
- **Literacy and Digital Literacy:** According to the 2011 Census, the total literacy rate was 73.5%, which is lower than the national average. The literacy rate among women is much lower. According to the Internet and Mobile Association of India (IAMAI), digital literacy is even more limited, particularly among women and older people living in rural regions.
- **Occupational Structure:** Over 60% of workers are employed in agriculture, which is mostly rain-fed and subsistence-oriented, resulting in erratic revenue streams.

3.3 The Financial Inclusion Landscape: Pre and Post PMJDY

Before 2014, there was a severe banking desertification in Odisha. In several districts, the Branch-to-Population Ratio (BPR) was negative, and the Credit-Deposit Ratios (CDR) were low, suggesting that capital was leaving less developed areas. With Odisha's robust network, especially under the Mission Shakti program, SHGs were a shining spot. Account opening increased dramatically after PMJDY (2014). As of early 2023, there were over 15 million PMJDY accounts in Odisha, with a significant proportion held by women, according to PMJDY data. This gave digital interventions a base layer. According to SLBC Odisha statistics, there are more Banking Outlets in Villages (BOBs), mostly through Business Correspondents (BCs).

3.4 Infrastructure: Digital and Physical

- **Telecom Connectivity:** Although 4G coverage has increased network quality and dependability, it is still uneven in rural villages and forested areas. There is a clear digital gap between the tribal hinterlands and the coastal plains.
- **Banking Infrastructure:** The BC model has been essential. Nonetheless, training and BC viability liquidity management continue to be problems. Digital transactions at BC points are further hampered by power shortages.

4. The Digital Payment Ecosystem in India: An Overview

Understanding the national architecture is key to analyzing its state-level implementation.

4.1 Key Instruments and Platforms

- **Aadhaar-enabled Payment System (AePS):** Allows bank customers to use Aadhaar authentication for basic banking (cash withdrawal deposit balance enquiry fund transfer) via BCs. It is crucial for last-mile connectivity where cards or PINs are barriers.
- **Unified Payments Interface (UPI):** A real-time payment system that merges multiple bank accounts into a single mobile application. Its simplicity (VPAs like name@bank) and interoperability have driven mass adoption.



- **Micro-ATMs:** Handheld devices used by BCs to conduct card-based or Aadhaar-based transactions acting as mobile bank branches.
- **IMPS NEFT RTGS:** Bulk and retail electronic fund transfer systems.
- **Bharat BillPay:** Centralized bill payment system.
- **Prepaid Payment Instruments (PPIs):** Wallets and prepaid cards.

4.2 The Driving Forces

- **Regulatory Push:** RBI's vision documents NPCI's operationalization.
- **Government Policy:** Mandating DBT for all central schemes incentivizing digital transactions.
- **Private Innovation:** Payment apps (PhonePe Google Pay Paytm) building user-friendly interfaces on UPI rails.
- **Consumer Acceptance:** Accelerated by demonetization and the COVID-19 pandemic which necessitated contactless payments.

5. Digital Payment Adoption in Odisha: Data and Analysis

5.1 Account Penetration vs. Active Usage

Because of PMJDY and DBT-linked accounts, account ownership in Odisha has nearly reached saturation. However, activity is the crucial metric. According to SLBC data, a significant part of PMJDY accounts exhibit limited transactional activity beyond the sporadic crediting of DBT monies (e.g., KALIA pensions MGNREGS salaries), even though a high percentage of these accounts are seeded with Aadhaar. This pattern points to "passive" or "DBT-only" use rather than active money management.

5.2 Platform-wise Analysis

- **AePS:** When it comes to cashing out DBT money, this is the most important DPS for rural Odisha. In terms of AePS transaction volumes, Odisha routinely ranks among the top states. This emphasizes both its function as a crucial last-mile cash interface and the ongoing dependence on cash. In the sense of eschewing cash, it is more of a financial access tool than a digital payment mechanism.
- **UPI:** In urban and semi-urban areas of Odisha, UPI use has grown rapidly (Bhubaneswar Cuttack Rourkela). However, it has little traction in rural and indigenous communities. Among the obstacles are:
 - Low-income rural households have less access to smartphones and the internet.
- **Language:** Even with vernacular alternatives, first-time, less literate users still find UPI apps difficult.
- **Use-case Limitation:** Until the entire ecosystem digitizes, the usefulness of a peer-to-peer (P2P) digital transfer software is less evident for communities whose primary source of income is cash (selling produce on a daily basis).



- Card and point-of-sale usage is still modest and concentrated in urban shops.
- **Micro-ATM Network:** Although the number of Micro-ATMs and BCs has grown, the quality of their services varies. Users frequently have to travel or wait during peak times (post-DBT credit festivals) due to liquidity problems.

5.3 The DBT Effect: A Double-Edged Sword

In Odisha, DBT has unquestionably been the main force toward digital financial inclusion. • **Benefits:** It guaranteed leakage-proof welfare delivery, made account opening mandatory, introduced millions of people to biometric authentication (Aadhaar), and encouraged them to visit BC points.

Drawbacks: It may have led to a DBT-centric perspective on banking. Many people view their bank account as a "scheme account" rather than a "savings account." It is a one-way (government-to-person) transaction that is frequently paid out right away. Converting these DBT touchpoints into chances for additional financial services while preventing a tiny percentage from using credit to buy microinsurance is the difficult part.

5.4 Regional Disparities within Odisha

District-level data would show a stark difference. Coastal districts like as Khordha (which includes Bhubaneswar), Cuttack, and Puri exhibit significantly greater levels of active banking and digital payment diversification (UPI online). On the other hand, despite having significant AePS volumes (for DBT), tribal-majority areas like Malkangiri Nabarangpur Koraput and Rayagada have low adoption of alternative digital channels. The socioeconomic disparity is reflected in this intra-state digital divide.

6. Persistent Challenges and Barriers

6.1 The Digital Divide: Beyond Connectivity

- **Access Divide:** Lack of smartphones affordable data plans and reliable electricity.
- **Capability Divide:** Digital illiteracy is the most profound barrier. The ability to navigate a UPI app understand menus identify secure practices and resolve failed transactions is not widespread.
- **Content Divide:** Most digital finance interfaces are not designed for semi-literate or illiterate users. Icon-based navigation voice-assisted interfaces in Odia and tribal languages (e.g., Santali Ho) and offline functionality are underdeveloped.

6.2 Trust and Behavioral Factors

- **Fear of Technology:** Concerns about making mistakes losing money or being defrauded are prevalent.

- **Lack of Transparency:** Failed transactions and the difficulty in immediate grievance redressal erode trust. The impersonal nature of digital interfaces contrasts with the trusted if inefficient informal systems.
- **Cash Preference:** The tangible nature of cash its universal acceptance in the local informal economy and its utility for micro-transactions make it a preferred medium. Digital payments need to demonstrate clear superior value.

6.3 Agent Network and Infrastructure Issues

- **BC Viability:** Low commission on DBT cash-outs makes the BC business unviable in low-volume areas leading to agent attrition.
- **Liquidity Management:** BCs in remote areas struggle with maintaining sufficient cash float especially after large-scale DBT credits.
- **Technical Glitches:** Device failures connectivity drops and Aadhaar server issues frequently interrupt service causing user frustration.

6.4 Regulatory and Product Gaps

- **Offline Digital Payments:** Solutions that work in low/no connectivity areas (like UPI Lite or offline AePS variants) are needed but not yet widespread.
- **Simplified Products:** Bundled products for rural households (small savings with accident insurance crop-linked credit) accessible via simple digital menus are limited.

7. Gender Dimensions of Digital Financial Inclusion in Odisha

- The face of financial exclusion is female. In Odisha, men are often in charge of household finances and technology (cell phones) due to patriarchal customs. The "phone in the hands of the husband" problem is prevalent even though PMJDY accounts are registered in women's names.
- **Why Data:** According to NFHS-5, only 33.2% of Odisha women have ever used the internet, despite the fact that 54.4% of them own bank accounts. The gender gap in digital finance is the difference between account ownership and digital capability.
- **Obstacles** Women are discouraged from using technology or engaging with male BC agents due to social conventions, limited mobility, poorer literacy, and less control over finances.
- **Opportunities:** Mission Shakti's SHGs are an effective channel. Access can be improved by encouraging women-only BC kiosks and training "Digital Sakhis," or female BCs. It can be revolutionary to create group-based digital solutions for SHG loans and savings.

8. The Way Forward: Models and Opportunities for Odisha

8.1 Building a Context-Sensitive Ecosystem



- **Hyper-local Digital Literacy Drives:** Leveraging Panchayati Raj institutions SHGs and NGOs to run sustained hands-on training in local languages using locally relevant use-cases (e.g., paying at the PDS shop receiving payment for produce).
- **Strengthening the BC Ecosystem:** Making the BC model more viable through higher commissions for facilitating value-added services (bill payments insurance credit referral) assured liquidity support and better technical backup.
- **Promoting Voice and Icon-based Interfaces:** Development and promotion of UPI and banking apps that use Odia/tribal language voice commands and intuitive icons for key functions.

8.2 Creating Relevant Use-Cases

- **Digitizing Agri-value Chains:** Integrating FPOs (Farmer Producer Organizations) and mandis with UPI or other DPS so that farmers can receive digital payments for their produce creating a natural incentive to use and retain digital money.
- **Digital SHG Management:** Apps for SHG bookkeeping digital collection of savings and direct transfer of loans to members' accounts.
- **Micro-Insurance and Pension Payments:** Promoting digital premium collection and claim initiation for schemes like PMJJBY PMSBY and the state's own health insurance scheme.

8.3 Public-Private-Community Partnership Model

The government must work closely with banks and fintechs to provide technology and products, the government to create demand through DBT and legislation, and community organizations like SHGs and NGOs to provide trust and last-mile reach. If used for financial services, the Odisha FiberNet initiative, which aims to provide high-speed internet to every Gram Panchayats, might be revolutionary.

8.4 Regulatory Sandbox for Tribal Areas

To test cutting-edge solutions for Odisha's tribal areas, such as offline-capable digital tokens, community-based transaction validation, or alternative credit models based on non-financial data, RBI can think about establishing a state-specific regulatory sandbox.

9. CONCLUSION AND RECOMMENDATIONS

9.1 Summary of Findings

This study comes to the conclusion that digital payment methods have contributed significantly, albeit insufficiently, to the advancement of financial inclusion in Odisha. Millions of people, particularly those living in rural and isolated locations, are now able to access formal banking for the first time because to the JAM Trinity and the DBT engine's effective construction of a vast digital financial infrastructure. In particular, the AePS network has emerged as a crucial tool for cash access. But the



state's transition from availability to meaningful, active use is still ongoing. The adoption of DPS is hindered by long-standing obstacles of digital illiteracy, infrastructure gaps, and behavioral trust concerns. It is marked by a DBT-dependency syndrome and major gender and urban-rural differences. Language and cultural barriers to mainstream technology products exacerbate these issues for native groups.

9.2 Recommendations

For a more impactful and equitable digital financial inclusion in Odisha a multi-stakeholder holistic strategy is recommended:

A. For the State Government and RBI:

- **Launch a Mass Digital Financial Literacy Mission:** Integrate digital finance modules into existing literacy and livelihood missions. Use community radio local cable TV and folk media in Odia and tribal languages.
- **Incentivize Transactional Banking:** Work with banks to design small incentive schemes (e.g., lottery-based rewards) for using accounts for savings or merchant payments not just DBT cash-out.
- **Strengthen the Public Digital Infrastructure:** Ensure Odisha FiberNet reaches BC points and Panchayat offices. Support the development of government-backed lightweight UPI applications for basic services.

B. For Banks and Payment Service Providers (PSPs):

- **Invest in Vernacular and Low-Literacy Interface Design:** Develop and aggressively market simple voice-guided apps.
- **Enhance BC Network Quality:** Provide robust training reliable devices with long battery life and real-time grievance resolution support. Explore a hub-and-spoke model where a well-equipped branch supports a cluster of BCs.
- **Create Bundled Products for Rural Households:** Offer simple auto-debit micro-savings or insurance products that can be sold and managed at the BC point.

C. For the Community and Civil Society:

- **Promote Women-centric Channels:** Scale up the “Digital Sakhi” model. Integrate digital finance training into all SHG meetings.
- **Build Local Champions:** Identify and reward tech-savvy youth in villages to act as para-bankers assisting neighbours with transactions and problem-solving.

9.3 Concluding Remarks

Odisha's path to financial inclusion is reaching a turning point. On a remarkable scale, the fundamentals of digital payments have been established. In order to enable its citizens—farmers, women, tribal communities, and small business owners—to develop resilience, take advantage of



opportunities, and fully engage in the digital economy, it is necessary to make sure that these rails carry a constant flow of financial activity rather than just intermittent welfare payments. Odisha can turn its digital payment network from a distribution system into a platform for true economic empowerment by tackling the technical and design obstacles. Other areas facing the difficult problem of leaving no one behind in the digital financial era can find guidance from the lessons acquired here.

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