Journal of Information Systems Engineering and Management
2025, 10(36s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Echoes of a Cashless Future: Digital Payments as Catalysts for Sustainable Finance

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ARTICLE INFO

Received: 22 Dec 2024

Revised: 18 Feb 2025

Accepted: 25 Feb 2025

ABSTRACT

The digital solutions for an economy bring more environmental and economic benefits for cashless transactions. For example, generating, transporting, and securing physical currency has huge costs involved. Compared to global economies, digital payments have been accepted very rapidly in India. The strong growth has been evident with the support of systems such as UPI and Aadhaar-linked services. India processed more than 9 billion monthly UPI transactions in the last year of this decade, marking a growth rate of 78% from the previous one. The country has set a benchmark for digital finance. Digital payment can help work towards sustainable finance through the management of cash dependency, upon which this paper bases its deliberation, emphasizing the Indian success in comparison with global circumstances. Handling cash carries a cost, but digitization also leads to a decrease in carbon footprint. This includes fintech innovations that can eventually bring better financial inclusion and efficiency. Analysis of key data points by comparison of the global and Indian digital payment ecosystems will help reinforce the pivotal role of digital payments in an endeavor to make for a more resilient economy.

Keywords: Digital Payments, Cashless Economy, Sustainable Finance, Financial Inclusion, Fintech Innovations.

INTRODUCTION

The payment system is changing dramatically. It is displacing the traditional culture of cash-based economies as the global financial scenario shifts toward more efficient and secure digital platforms. It is not only an advance technology but also an important step toward dealing with serious economic challenges, such as bringing about financial inclusion, environmental sustainability, and accelerated economic growth. Digital payments are gradually being seen as a way of enhancing transparency, reducing tax evasion, and developing more robust financial systems by avoiding overreliance on cash that incurs enormous economic and environmental costs.

The global digital payments market is anticipated to be $12.55 trillion by the year 2027, considering a CAGR of 13.6%. Emerging markets, especially India, have witnessed dramatic growth in the volume of digital transactions. Initiatives of Digital India along with financial inclusion programs such as PMJDY have expanded the digital payment user base. On an average, there were about 9 billion monthly UPI transactions in India in 2023, and the figure is likely to increase hugely as smartphone penetration and internet penetration are gradually becoming better across rural regions. This puts India at the front of the league of countries regarding the adoption of digital payments.

Digital payments can also be environmentally relevant because they cut down on the carbon footprint that otherwise would have been involved if there were more cash-based systems in place. According to research, the production and distribution of physical money are resource-heavy undertakings. A study, for example indicates that elimination of cash can reduce as much as 1% of a country's annual CO_2 emissions, which is quite a factor when reckoned across

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countries. This makes this transition to digital payments both advantageous for economies, in the form of increasing financial inclusion, and helps toward achieving environmental sustainability.

This paper is based on how digital payments are changing the face of promoting sustainable finance, particularly in India, which is at the forefront of this transition. It analyzes economic and environmental benefits from reduced cash dependency and compares it to global trends for digital payments, noting how fintech innovation is affecting financial inclusion and sustainability.

Overview of India's Digital Payment Ecosystem:

India's digital payment landscape has seen exponential growth, positioning it as a global leader in adopting cashless solutions. Through government-backed initiatives and fintech innovations, the country's transition from traditional cash-based transactions to digital platforms has been transformative. One of the most significant contributors to this shift has been the Unified Payments Interface (UPI), which, in FY 2023-24, processed over 130 billion transactions. This massive scale highlights UPI's role in reducing cash dependency, enhancing transaction efficiency, and promoting financial inclusion.

This growth has also brought sustainability into focus. The National Payments Corporation of India (NPCI), which manages platforms like UPI and RuPay, has set ambitious goals toward achieving net-zero emissions by 2050. Their efforts are already yielding results, as seen in the 1,23,190 kWh of renewable energy generated through solar installations at their data centers in Hyderabad and Chennai. This transition toward renewable energy not only reduces operational costs but also lessens the environmental footprint of India's financial system.

In addition to environmental progress, digital payment systems have enhanced financial inclusion, particularly in rural and underserved areas. The Pradhan Mantri Jan Dhan Yojana (PMJDY) and Digital India initiatives have extended banking and digital financial services to millions, enabling individuals to participate in the formal financial system. In FY 2023-24 alone, NPCI organized 37 financial literacy sessions aimed at promoting the benefits of digital payments among rural populations. These initiatives underscore the pivotal role of digital payments in supporting both economic growth and sustainability.

By decreasing cash dependency and advancing sustainable practices, India's digital payment platforms are playing a crucial role in shaping the future of finance. This transition not only strengthens the financial ecosystem but also aligns with broader environmental and social goals, making India a standout model in the global shift toward cashless economies.

Emission Factors for Payment Drivers:

	ATM	Bank cards	Branches	Bank Notes	Coins	Cheques	e-KYC	Micro ATMs	PoS machine	QR codes
Paper consumption	✓	✓	✓	✓		✓	✓	✓	✓	✓
Raw material consumption			✓	✓	✓			✓	✓	
Electricity consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fuel consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Plastic consumption		✓						✓	✓	✓
Metal consumption		✓								

Source: NPCI (2024)

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This analysis shows varied environmental impacts in different banking services. Paper-based services, like branches, cheques, and bank notes, require much paper and raw materials, while digital services, like ATMs, PoS machines, and QR codes, consume much electricity and plastic. Although digital banking saves paper, the environmental costs are shifted to electricity, fuel, and plastic, raising questions on sustainability. The greener practices toward banking can call for innovations, such as the use of eco-friendly, biodegradable materials on bank cards or renewable source energy for powering digital infrastructure. In a nutshell, it is both old and new technologies that should harmoniously work together to minimize impacts on natural resources in banking for a reduced total ecological footprint.

SIGNIFICANCE OF THE STUDY

The massive growth in e-payments in India from 22.8 billion transactions in 2017 to 162.5 billion in 2023 marks a revolutionary shift in the country's financial landscape. This study explores how digital payment systems such as UPI and Aadhaar-enabled payments contribute to sustainable finance by reducing the reliance on cash, which comes with significant economic and environmental costs. By minimizing the production and handling of physical currency, digital payments can effectively reduce carbon emissions associated with cash logistics.

Additionally, this research examines the role of digital payment platforms in advancing financial inclusion, highlighting government-led initiatives like PMJDY and Digital India that have provided formal financial access to millions, particularly in rural and underserved areas. This type of inclusion fosters socio-economic equity and aligns with national goals for inclusive growth, demonstrating the transformative power of digital infrastructure in bridging financial divides.

The study provides valuable insights for policymakers, financial institutions, and fintech entities, showcasing why continued innovation and strategic investment in digital payment ecosystems are crucial for fostering sustainable finance. Furthermore, it positions India as a global model for other economies seeking to achieve cashless, inclusive, and sustainable financial futures.

RESEARCH OBJECTIVES

1. To assess how digital payments contribute to sustainable finance in India, with a specific focus on reducing the environmental footprint linked to cash handling and production.
2. To analyze the role of digital payment systems, such as UPI and Aadhaar-enabled payments, in promoting financial inclusion, especially among rural and underserved populations.
3. To compare India's approach to digital payment adoption with global practices, highlighting unique contributions to sustainable finance.
4. To analyze the impact of UPI transaction growth on currency circulation in India and how this relationship reflects the progress toward a cashless economy.

HYPOTHESIS

1. H01: There is no significant relationship between digital payment volume and CO_2 emissions in India.
2. H02: The increased adoption of UPI and Aadhaar-enabled payments does not significantly improve financial inclusion among rural and underserved populations.
3. H03: There is a no significant relationship between the growth of UPI transactions and the volume of currency in circulation.

LITERATURE REVIEW

Author(s), Year	Title of Study	Objective	Research Method	Key Findings
Satish Kumar et al., 2021	Past, Present, and Future of Sustainable Finance: Insights	To provide a comprehensive review of sustainable finance	Bibliometric analysis with big data analytics and machine learning	Identified key themes in sustainable finance such as climate financing,

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Author(s), Year	Title of Study	Objective	Research Method	Key Findings
	from Big Data Analytics Through Machine Learning	research using big data and machine learning	from 936 scholarly articles	green bonds, and ESG; offered insights into research trends and future directions
Nicholls,2021	Sustainable Finance: A Primer and Recent Developments	To provide an overview of sustainable finance, highlighting tools, strategies, and regulatory frameworks	Qualitative analysis of sustainable finance landscape	Sustainable finance integrates environmental, social, and governance (ESG) factors; supports green and inclusive recovery
Alex Edmans, Marcin Kacperczyk, 2022	Sustainable Finance	To introduce the integration of ESG issues in finance and highlight reasons for its rapid rise	Review of literature and analysis	Identifies financial relevance, nonfinancial objectives, and investor preferences as key drivers of ESG integration
Harleen Kaura & Priya Devi, 2023	A Discourse on Role of Digital Payments Adoption to Drive MSMEs Towards Sustainable Advantage	To explore how the adoption of digital payments impacts the sustainable advantage of MSMEs	Structural equation modeling (SEM), data collected via questionnaire from MSMEs in India	Adoption of digital payments significantly improves sustainable advantage in MSMEs, with information accessibility moderating this effect.
Rohanshi Vaid, Shubhangi Gupta, Ammu George, 2023	Decoding the Sub-national Digital Payment Revolution in India	To analyze regional disparities and the drivers of digital payment adoption across India's sub-national economies	Analysis of disaggregated digital payment transaction data and policy initiatives	Sub-national regions like Bihar and Odisha, despite lower digital competitiveness, saw substantial growth in digital payments due to Bank Sakhi programs
John Beirne, David G. Fernandez, 2023	Digital Finance and Sustainability: Impacts, Challenges, and Policy Priorities	To explore the role of digital finance in supporting sustainable economic development and financial inclusion in Asia	Overview of 13 research articles; thematic analysis of impacts on financial inclusion, sectoral and firm performance	Digital finance enhances financial inclusion, improves sectoral productivity, supports SMEs, and drives entrepreneurship
Amitabh Patnaik et al., 2023	Exploring User Acceptance of Digital Payments in India: An Empirical Study Using an Extended Technology Acceptance Model.	To investigate user acceptance, perceived usefulness, and actual usage of digital payments in India.	Structural Equation Modeling (SEM) and Technology Acceptance Model (TAM)	Financial literacy does not directly impact digital payment acceptance; perceived usefulness and service quality positively impact adoption
Sreenu Nenavath & Shashwat Mishra, 2023	Impact of Green Finance and FinTech on Sustainable Economic Growth: Empirical Evidence from India	To analyze how green finance and financial technology contribute to sustainable economic growth in India	Panel regression analysis with a two-step Generalized Method of Moments (GMM) to address endogeneity	Green finance significantly improves economic efficiency, environmental protection, and system development. FinTech

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Author(s), Year	Title of Study	Objective	Research Method	Key Findings
				enhances green finance's impact on environmental protection but not on economic efficiency
Khando, Islam, Gao, 2023	The Emerging Technologies of Digital Payments and Associated Challenges: A Systematic Literature Review	To provide a comprehensive overview of digital payment technologies and the challenges associated with them	Systematic literature review of empirical studies	Identified four main types of digital payment technologies: card payments, e-payments, mobile payments, and cryptocurrencies. Key challenges were grouped into social, economic, technical, awareness, and legal categories.
Morshadul Hasan et al., 2024	FinTech and Sustainable Development: A Systematic Thematic Analysis	To examine how FinTech can influence sustainable development across financial, economic, and environmental dimensions	Systematic literature review integrating human and machine-generated processing	FinTech improves financial inclusion, reduces poverty, mitigates income inequality, and promotes green financing
Alan S. Gutterman, 2024	Sustainable Finance	To explore the integration of ESG in finance and sustainable investment strategies	Qualitative analysis of sustainable finance models and global policy frameworks	Sustainable finance aids in achieving SDGs through ESG-focused financial models; highlights public-private partnerships as essential for climate goals
Dr. Devendra Kumar Dixit et al. 2024	The Use of Digital Payment Methods and its Implications on Financial Inclusion	To examine the impact of digital payments on financial inclusion in India, focusing on adoption rates, user demographics, and barriers	Quantitative survey across multiple Indian states with 500 respondents	Digital payments reduce cash dependency and promote financial autonomy; higher adoption seen among younger individuals. Key barriers include digital literacy and infrastructure inadequacies in rural areas

RESEARCH METHODOLOGY

This study relies on a secondary data analysis approach, using quantitative and comparative analyses to evaluate the role of digital payments in promoting sustainable finance in India. The research leverages data from reputable sources, including the NPCI Sustainability Report (2023-24), Digi Dhan Mission Report, SDA India Index (2023-24).

Data Collection: Relevant data on UPI transactions, ATM penetration, financial inclusion indicators, and environmental impact were gathered from official government and institutional reports.

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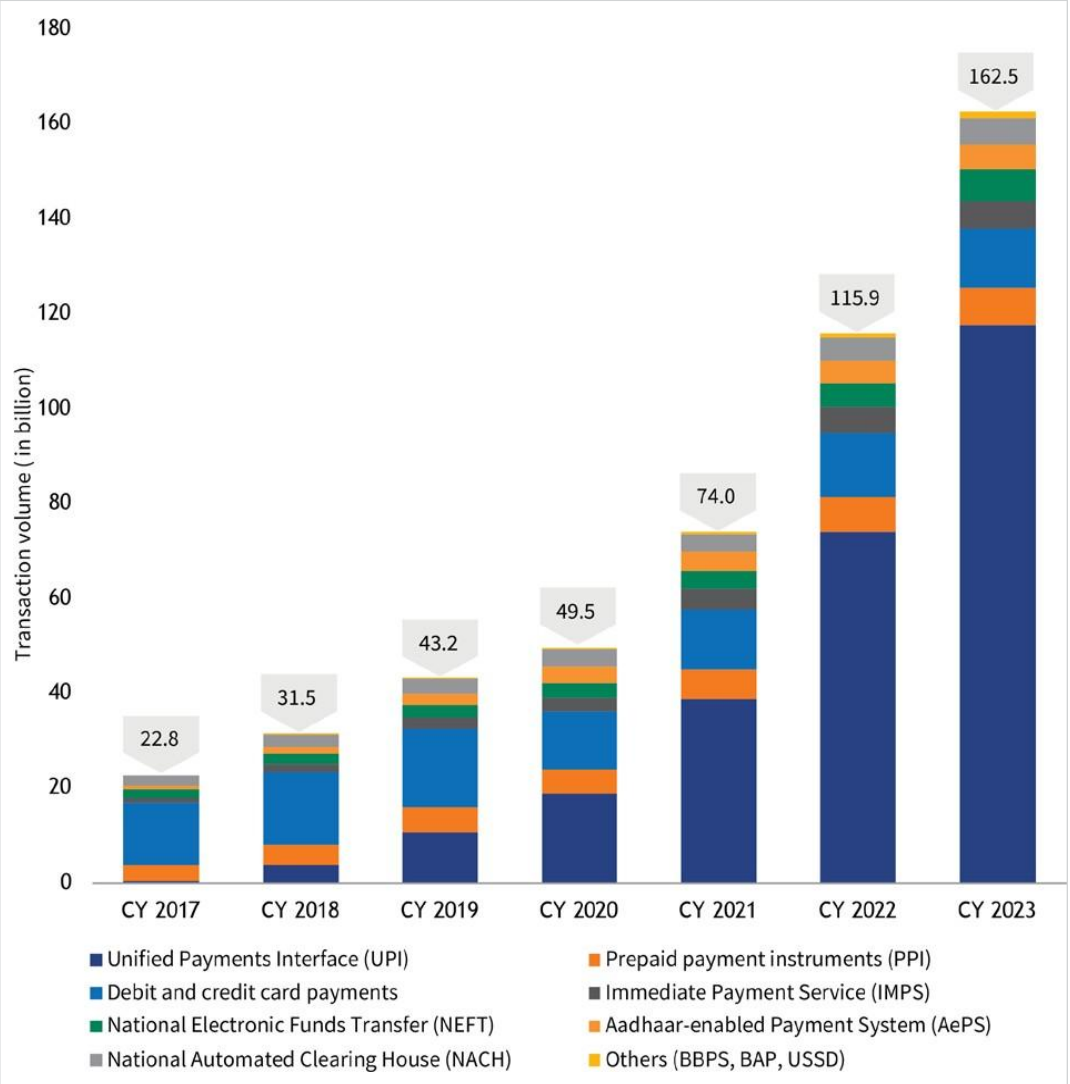
Data Analysis:

- **Quantitative Analysis**: Statistical tests, such as correlation analysis, t-tests, and multiple regression analysis, are employed to examine relationships between digital payment adoption and sustainability indicators.
- **Comparative Analysis**: India's digital payment ecosystem is compared with global practices to position India's achievements and challenges within an international framework. Key comparison metrics include transaction volume, environmental impact, and financial inclusion growth.

Growth of E-Payments in India:



Source: NPCI (2024)

The chart shows a significant increase in digital payment transactions in India from 22.8 billion in CY 2017 to 162.5 billion in CY 2023. Unified Payments Interface (UPI) has emerged as the dominant payment method, particularly from CY 2020 onwards, reflecting its widespread adoption. Other methods like NEFT, IMPS, and AePS also display steady growth, contributing to a diversified digital payment ecosystem. The rise in AePS transactions highlights progress in financial inclusion. This growth is driven by regulatory support, technological advancements, and increased mobile and internet penetration.

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Table : Annual CO_2 Emissions and Digital Payment Volume in India

Year	CO_2 Emissions (Trillions of Tons)	Digital Payment Volume (Trillions of INR)	
2018–2019	0.00257	1.5	**Pearson correlation coefficient (r) = 0.4628**
2019–2020	0.00254	2.9	
2020–2021	0.00232	4.3	**r^2 = 0.2142**
2021–2022	0.00253	5.6	**P-value = 0.4325**
2022–2023	0.00270	9.8	

Source: MoEFCC and NPCI (2024)

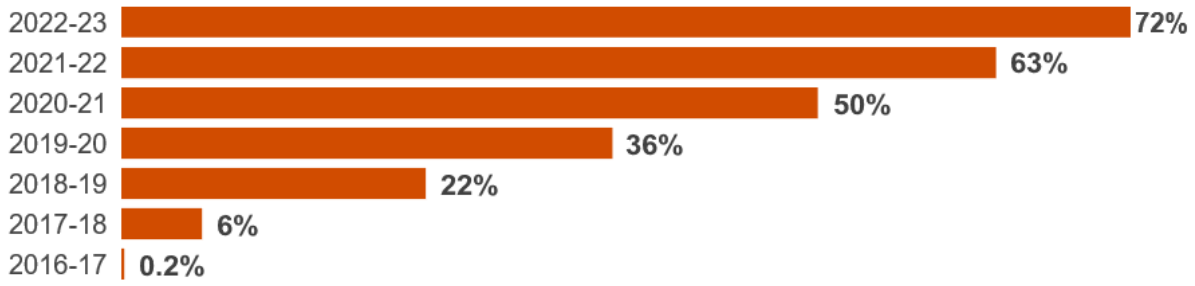
Null Hypothesis (H_0): There is no significant relationship between digital payment volume and CO_2 emissions in India.

Alternative Hypothesis (H_1): There is a significant relationship between digital payment volume and CO_2 emissions in India.

Statistical Test Results:

The statistical analysis of the correlation between the digital payment volume and CO_2 emissions in India was found to be Pearson correlation coefficient at 0.4628 and p-value of 0.4325. The weak positive correlation shows the relationship between an increase in digital payment volume and the rise in CO_2 emissions, but the p-value was very high, meaning the relation is not statistically significant. Thus, we do not find evidence of a significant linear relationship between the growth of digital payments and the changes in CO_2 emissions. This could suggest that other factors might be driving the trends in CO_2 emissions in India.

UPI as a Percentage of Total Retail Payments:



Source: NPCI (National Payments Corporation of India -2024)

The impact digital payment platforms have brought upon India's financial landscape becomesapparent in a graph that shows UPI as a percentage of total retail payments. The rapid growth and significant market share UPI have gained in retail payments indicate a shift to cashless transactions even in small merchants and individual users.

This wide acceptability across different sections has supported the paper's argument on financial inclusion as this shows how UPI made digital payments accessible and affordable for diverse communities, including the rural and economically disadvantaged population.

Moreover, integration of UPI in the retail sector is aligned with sustainable finance principles. As UPI reduces cash dependence, it indirectly supports environmental sustainability through lower cash management costs and even potential reductions in carbon emissions. It represents a very important step towards India's vision of a cashless and inclusive economy, where UPI stands as a catalyst for sustainable financial growth.

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Expanding Access: PMJDY Account Distribution Across Rural, Urban, and Gender Demographics

Bank Name / Type	Number of Beneficiaries at rural/semiurban centre bank branches	Number of Beneficiaries at urban metro centre bank branches	No Of Rural-Urban Female Beneficiaries	Number of Total Beneficiaries	Deposits in Accounts (In Crore)	Number of Rupay Debit Cards issued to beneficiaries
Public Sector Banks	26.33	15.63	23.13	41.96	186146.46	31.77
Regional Rural Banks	8.62	1.45	5.85	10.06	46383.77	3.58
Private Sector Banks	0.74	0.92	0.90	1.66	6972.99	1.37
Rural Cooperative Banks	0.19	0.00	0.10	0.19	0.01	0.00
Grand Total	**35.87**	**18.00**	**29.99**	**53.87**	**239503.22**	**36.72**

Source: pmjdy.gov.in (2024)

Financial Inclusion through PMJDY and Digital Payment Systems

PMJDY has taken quite a step forward towards the improvement of financial inclusion across India as well is very well portrayed in data. Among these, it holds accounts belonging to rural residents as 53%, and of the total 1.46 billion accounts held, women have 55.63% accounts. These numbers target some of the largest access barriers faced by the poor and geographically isolated group, thereby bringing wide penetration into rural and underdeveloped populations-a good beginning toward inclusive growth in the financial ecosystem in India.

Extending PMJDY from merely an account opening service, through integrations into platforms such as Unified Payments Interface and Aadhaar-enabled Payment Systems, it supports making easier, more efficient financial transactions with security. For these platforms, even a resident from a village or the backward sections of a community could actually join the fray. Beneficiaries of PMJDY now can receive direct benefits transfer, mobile payments processing, and access subsidies by means of UPI and AePS. Such an amenity decreases dependency on cash and lowers the time and cost required to do the transactions, thus empowering the rural resident directly as well as the women involved.

Whereas PMJDY and the digital payment systems brought some change, much needs to be done in low infrastructural and lower digital literacies of various regions. To make an added value for financial inclusion, a more strengthening of the infrastructure of digital literacy programs would be needed, particularly at rural and remote sites. The benefit of this action will not only be immense as regards coverage but also all pervasive and effective. This facility offered by the digital financial services would allow the rural and other deprived segments of society to derive its fullest benefits.

Table: Comparison of UPI Users and PMJDY Account Growth with Rural Account Distribution

Year	UPI Users (in millions)	Rural Account Percentage (%)	
2018	120	66	**Pearson correlation coefficient (r) = 0.9473**
2019	200	66	
2020	300	66	
2021	450	67	**r^2 = 0.8973**
2022	600	67	**P-value = 0.0041**
2023	750	68	

Source: pmjdy.gov.in (2024)

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Null Hypothesis (H0): The increased adoption of UPI and Aadhaar-enabled payments does not significantly improve financial inclusion among rural and underserved populations.

Alternative Hypothesis (H1): The increased adoption of UPI and Aadhaar-enabled payments significantly improves financial inclusion among rural and underserved populations.

Statistical Test Results:

The Pearson correlation analysis conducted to determine the relationship between UPI user growth and rural PMJDY account percentage in India yields a Pearson correlation coefficient = 0.9473 and a p-value of 0.0041. This indicates a strong positive linear relationship between the increase in UPI users and the rise in rural financial inclusion as reflected by the percentage of rural PMJDY accounts. The r^2 value of 0.8973 suggests that approximately 89.73% of the variance in rural PMJDY account percentage can be explained by the growth in UPI users.

The low p-value confirms the statistical significance of this relationship, as it is well below the standard significance level of 0.05. This result leads to the rejection of the null hypothesis (H0), which postulated that there is no significant correlation between UPI user growth and rural financial inclusion. The analysis supports the alternative hypothesis, demonstrating that the variables have a positive and significant association.

These findings underscore the critical role of digital payment systems, particularly UPI, in enhancing financial inclusion among rural and underserved populations. The adoption of UPI has substantially contributed to the increase in rural account ownership, reinforcing its importance in promoting inclusive economic development and bridging the financial access gap in less accessible areas.

Table: Comparison of India's Digital Payment Model with Global Systems

Feature	India (UPI, AePS)	China (WeChat Pay, Alipay)	Kenya (M-Pesa)	European Union (Various Systems)
Scale of Adoption	36 billion transactions in 2023; nationwide reach	Over 1 billion users, primarily urban-focused	51 million users, primarily rural and semi-urban	Widely used but fragmented across systems
Interoperability	High (UPI connects multiple banks and providers)	Moderate (WeChat Pay and Alipay are separate)	Limited to M-Pesa network	Low to moderate (no single interoperable platform)
Inclusivity Initiatives	PMJDY, Aadhaar- based AePS for rural/underserved	Primarily urban; no large-scale inclusion program	Widely adopted in underserved areas	Lacks focused government-backed inclusion efforts
Biometric Access (Security)	Aadhaar-based biometric authentication	No equivalent biometric system	No equivalent biometric system	Limited biometric use in payment systems
Environmental Focus	Solar-powered data centers; low-cost transactions	Limited initiatives focused on sustainability	Minimal environmental initiatives	Varies; some banks promote low-energy transactions
Policy Framework	Strong public-private partnership (e.g., NPCI)	Driven by private-sector innovation	Telecom-driven with some government support	Primarily private- sector initiatives, limited government involvement
Cost of Transactions	Low due to government subsidies and low-cost structure	Low to moderate	Low to moderate	Moderate to high

The table above represents an Indian digital payments model which is unique in the high accessibility, support to the government-led inclusiveness program, and environmental sustainability initiative. It is quite different from the largely urban-centric systems of China or a fractured approach followed in the EU. Here, it is the public-private partnership under the NPCI which leads to mass adoption seen in India. UPI interoperability across banks and Aadhaar-enabled payment systems ensure that even the most rural and underserved populations can have safe access to financial services, putting India at the top of the list of countries for digital finance inclusion.

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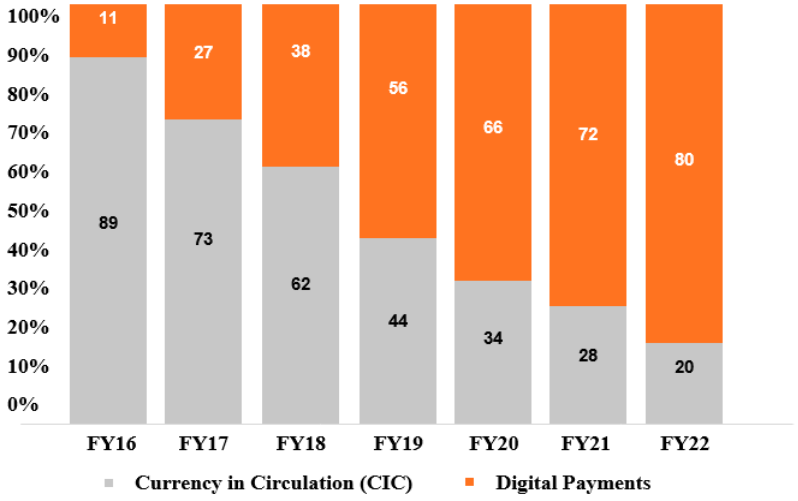
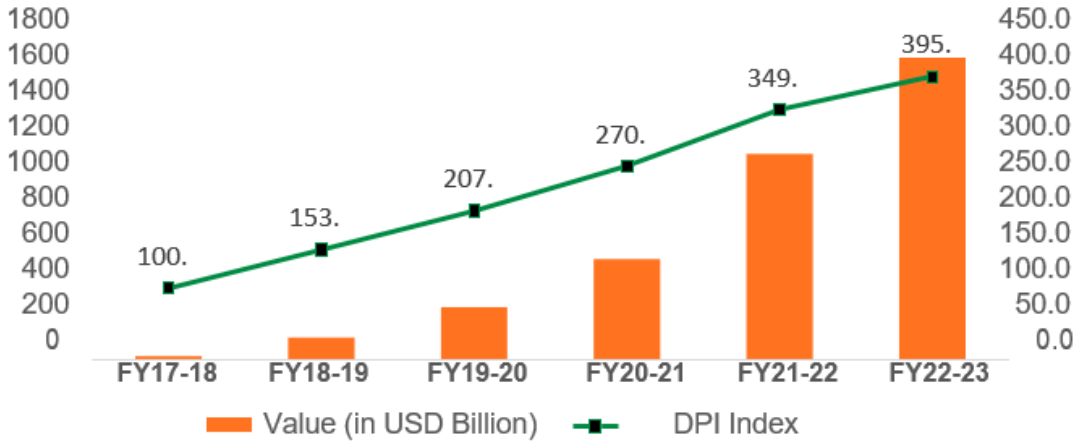
This commitment of India to environmental sustainability through solar-powered data centers and low-energy transaction methods aligns digital payments with the sustainable finance objectives. The model will prove useful for countries that would like to implement digital payment systems accessible, secure, and environmentally friendly. Experience in India has shown how digital payments can reduce economic inequality and still promote an eco-friendly economy.

UPI Transaction Value vs. Currency Circulation in India



Source: SBI Research (2023)

RBI Digital Payment Index: Tracking Adoption and Growth



Source: SBI Research (2024)

Analyzing "RBI Digital Payment Index: Tracking Adoption and Growth" and "UPI Transaction Value vs. Currency Circulation in India," further deepens insight into the relationship between the adoption of digital payments and currency usage. The sustainable growth curve of the RBI Digital Payment Index indicates increased digital payment infrastructure and user participation in India. This trend represents progress toward less dependence on cash and a potential shift to a cashless economy.

As seen in the comparison in "UPI Transaction Value vs. Currency Circulation in India", the growth in UPI transactions correlates with the tamed growth in currency circulation, and this trend alone provides a basis for understanding the growth in digital payments offsetting the reliance on cash to an extent that needs further analysis to include contributory socio-economic factors like digital literacy and rural infrastructure.

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Table: Comparison of UPI Transaction Value and Currency in Circulation

Year	UPI Transaction Value (in trillion INR)	Currency in Circulation (in trillion INR)	
2018	8.2	18.3	**Pearson correlation coefficient (r) = 0.8843**
2019	15.3	19.2	
2020	29.0	21.3	
2021	74.0	22.0	**r^2 = 0.7821**
2022	126.0	22.7	**P-value = 0.01929**
2023	183.0	23.0	

Source: Reserve Bank of India and National Payments Corporation of India.(2024)

Null Hypothesis (H_0): There is no significant relationship between the growth of UPI transactions and the volume of currency in circulation.

Alternative Hypothesis (H_1): There is a significant relationship between the growth of UPI transactions and the volume of currency in circulation.

Statistical Test Results:

The Pearson correlation analysis examining the relationship between UPI transaction value and currency in circulation in India yields a Pearson correlation coefficient = 0.8843 and a p-value of 0.01929. This strong positive correlation indicates a significant linear relationship between the increase in UPI transaction value and the trends in currency circulation. The r^2 value of 0.7821 suggests that approximately 78.21% of the variance in currency circulation can be explained by the growth in UPI transaction value.

The low p-value confirms the statistical significance of this relationship, as it is below the standard significance threshold of 0.05. This result leads to the rejection of the null hypothesis (H_0), which posited that there is no significant correlation between UPI transaction growth and currency circulation. Consequently, the analysis supports the alternative hypothesis, indicating that there is a significant and positive association between these variables.

These findings imply that as UPI transaction values increase, currency circulation trends are impacted, suggesting that digital payments may influence cash usage patterns in the economy. While the association is strong, the positive correlation also highlights that the shift to digital payments may not entirely replace cash usage, but rather complements it, reflecting a gradual transition towards a cashless economy.

Future Scope of the Study:

This work gives access pathways for further exploration of both qualitative and quantitative aspects associated with adopting digital payments. Future research studies may focus on different dimensions of user behavior and attitudes in various socio-economic contexts, tracing the lasting impact of digital payments in terms of financial inclusion and economic resilience through longitudinal studies. A cross-country comparison of India's digital payment framework with that of other emerging economies would prove informative. Thirdly, the environmental implication of low money print due to the increased digital money payment also warrants further research towards better development for sustainable finance. Last but not least, research into the introduction of emerging technologies such as blockchain and artificial intelligence into digital payments might offer new information on their capacity to motivate efficiency and sustainability.

Findings of the Study:

- The study demonstrates a strong positive correlation between the growth of UPI users and rural PMJDY accounts, showing progress in financial inclusion.

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- A significant relationship exists between rising UPI transaction values and currency circulation, reflecting the continued yet diminishing role of cash.
- UPI adoption has made financial services more accessible in rural areas, promoting economic inclusivity.
- Ongoing challenges, such as gaps in digital literacy and infrastructure, highlight the need for policy enhancements.

CONCLUSION

This study confirms that digital payment systems, particularly UPI, are crucial for promoting financial inclusion and fostering sustainable financial practices in India. The analysis demonstrates significant correlations between the growth of digital transactions and increased financial access in rural areas, alongside notable changes in currency circulation patterns. These findings emphasize the transformative potential of digital payments in driving economic and environmental benefits. However, addressing challenges such as digital literacy gaps and infrastructure limitations is essential. Continued investment in digital infrastructure and comprehensive literacy programs is vital to maximize these benefits and support the transition toward a cashless, inclusive, and sustainable economy.

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