



A Statistical Deep Dive into India's
Digital Payment Boom:

Comparative Analysis of Google Pay & PhonePe

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Project Agenda



Problem **Statement**

Research **Questions**

Data **Overview**

Methodology

Analysis & **Findings**

Recommendations

Problem Statement

Despite PhonePe's dominant market share, both UPI platforms face challenges in optimizing marketing spend, cashback effectiveness, and rural adoption. This project uses statistical analysis to identify actionable strategies for maximizing transaction growth and profitability.



Research Questions



- 1. **Performance Drivers:** What factors most influence UPI transaction volume and value?
- 2. **Cashback Effectiveness:** When and where do cashback offers generate the highest ROI?
- 3. **Rural Growth Barriers:** Why does rural adoption lag, and how can it be accelerated?
- 4. **Competitive Edge:** How can platforms optimize strategies to gain market share?

Data Source

NPCI (UPI Transaction Data)



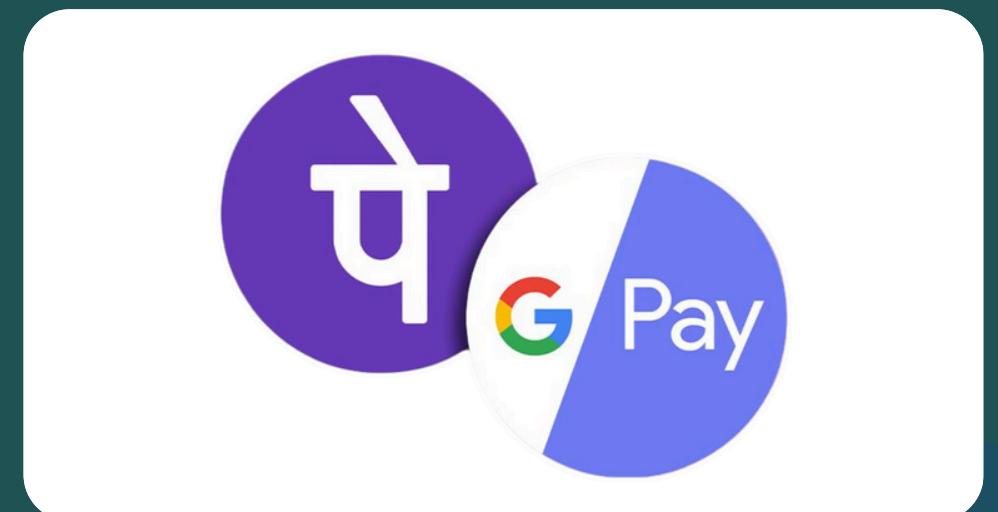
NPCI.org

RBI (Payment System Reports)



[RBI Publications](#)

Company Blogs



[Google Pay](#) | [PhonePe](#)

Data Overview

Platforms

Google Pay and PhonePe

Source

Monthly UPI transaction data
(2021-2025)

Total Records

Monthly data across 5 years per
platform



Key Variables

Transaction Volume (Millions)	Transaction Value (₹B)
Avg. Transaction Value (₹)	Monthly Active Users (MAU)
Success Rate (%)	Urban/Rural Split (%)
Marketing Spend (₹M)	Cashback Offers (Y/N)
Festival Season (Y/N)	Merchant Count (Millions)

Market Share (%)



Initial Insights



- **PhonePe** leads in volume, MAUs, and merchant count
- **Google Pay** shows higher avg. transaction value and urban dominance
- **Both** platforms maintain >98% success rate
- Cashback/festival effects vary month-to-month

Methodology



Data Preparation: Cleaned & merged monthly data (2021-2025); encoded categorical variables

Descriptive Statistics: Analyzed mean, variance, and trends across platforms

Exploratory Data Analysis (EDA): Trends, outliers, cashback effects, urban-rural split

Correlation Analysis: Identified relationships between features (volume, value, MAU)

Regression Modeling:

Linear: Predict market share

Hypothesis Testing:

- T-Test: Cashback impact on volume
 - Chi-Square: Cashback-festival association
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Descriptive Stats

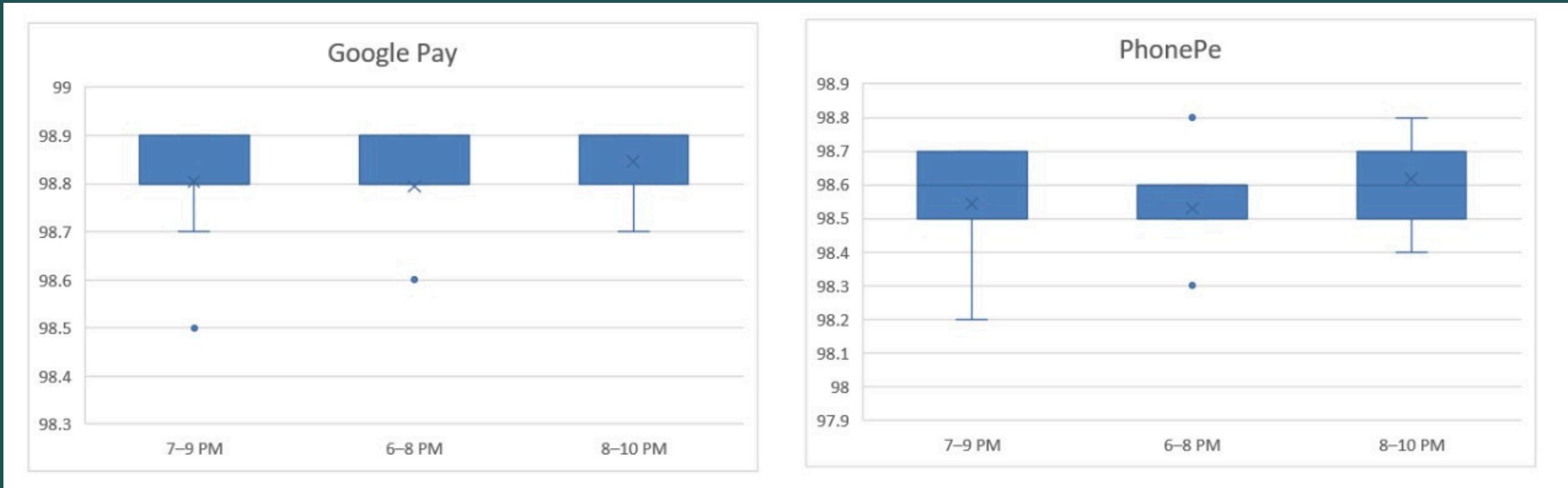
Google Pay						
Parameters	Transaction Volume (Millions)	Transaction Value (₹B)	Avg. Transaction Value (₹)	MAU (Millions)	Marketing Spend (₹M)	Success Rate (%)
Mean	1756.470588	3146.666667	1775.490196	129.1176471	254.9019608	98.80980392
Standard Error	83.00806648	159.7313103	6.960075081	5.962145098	12.06151731	0.014620668
Median	1750	3100	1771	113	250	98.8
Mode	1600	2800	1750	105	220	98.8
Standard Deviation	592.7961657	1140.709721	49.70487805	42.57823249	86.13646264	0.104412455
Sample Variance	351407.2941	1301218.667	2470.574902	1812.905882	7419.490196	0.010901961
Kurtosis	-1.093962925	-1.10255993	-1.385880515	-1.038870632	-0.815422193	1.783894863
Skewness	0.022850714	0.101757459	0.12659333	0.547668362	0.107665909	-1.409583695
Range	2080	4000	158	146	330	0.4
Minimum	820	1400	1704	74	110	98.5
Maximum	2900	5400	1862	220	440	98.9
Sum	89580	160480	90550	6585	13000	5039.3
Count	51	51	51	51	51	51

PhonePe						
Parameters	Transaction Volume (Millions)	Transaction Value (₹B)	Avg. Transaction Value (₹)	MAU (Millions)	Marketing Spend (₹M)	Success Rate (%)
Mean	3114.117647	5451.372549	1719.392157	202.8039216	533.0392157	98.55490196
Standard Error	211.5333704	402.3678952	11.1603668	9.31315829	41.32394227	0.019666579
Median	2900	4800	1688	200	480	98.6
Mode	2200	4500	1667	130	250	98.6
Standard Deviation	1510.650425	2873.481526	79.7009607	66.50925337	295.1119761	0.140447464
Sample Variance	2282064.706	8256896.078	6352.243137	4423.480784	87091.07843	0.01972549
Kurtosis	-1.106181216	-0.879800544	2.722499901	-1.135662755	-0.897969495	0.387309768
Skewness	0.330955468	0.504599138	1.602506946	0.254237918	0.459753172	-0.622785594
Range	4950	9750	393	222	1010	0.6
Minimum	1050	1750	1607	108	140	98.2
Maximum	6000	11500	2000	330	1150	98.8
Sum	158820	278020	87689	10343	27185	5026.3
Count	51	51	51	51	51	51

Google Pay shows lower transaction volume and user base compared to PhonePe, but a slightly higher average transaction value and success rate.

PhonePe leads in overall usage and marketing spend, but both platforms demonstrate high reliability with success rates near 98.5%.

EDA: Success Rate and Peak Hours



The box plots show that Google Pay maintains a consistently high and stable success rate (around 98.8%) across all evening time slots, with minimal variation.

In contrast, PhonePe exhibits slightly more fluctuation in success rates and a lower average, especially between 7-9 PM.

EDA: Correlation Matrix

Google Pay

	Avg. Transaction Value (₹)	Success Rate (%)	Cashback Offers (Y/N)	Festival Season (Y/N)
Avg. Transaction Value (₹)	1			
Success Rate (%)	0.514681441	1		
Cashback Offers (Y/N)	0.091558625	0.107288356	1	
Festival Season (Y/N)	0.140997008	0.170957944	0.39223227	1

PhonePe

	Avg. Transaction Value (₹)	Success Rate (%)	Cashback Offers (Y/N)	Festival Season (Y/N)
Avg. Transaction Value (₹)	1			
Success Rate (%)	0.713255621	1		
Cashback Offers (Y/N)	0.044591759	0.054220484	1	
Festival Season (Y/N)	0.096821321	0.213128159	0.375045785	1

For Google Pay, Avg. Transaction Value and Success Rate are moderately correlated (0.51), with weak links between Cashback Offers and Festival Season (0.39), and other variables mostly independent.

For PhonePe, the correlation between Avg. Transaction Value and Success Rate is strong (0.71), while Cashback Offers and Festival Season show a moderate link (0.38), with weak correlations elsewhere.



Test Results

Regression (Google Pay):

Problem Statement: To identify key factors affecting Google Pay's **market share** using multiple linear regression.

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.926010606							
R Square	0.857495642							
Adjusted R Square	0.845103958							
Standard Error	0.901188775							
Observations	51							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	4	224.7983672	56.1995918	69.19928612	7.15299E-19			
Residual	46	37.35849555	0.812141208					
Total	50	262.1568627						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	962.131009	139.0732844	6.918158386	1.20898E-08	682.1910068	1242.071011	682.1910068	1242.071011
Avg. Transaction Value (₹)	-0.030559291	0.002997115	-10.19623532	2.18583E-13	-0.03659217	-0.024526411	-0.03659217	-0.024526411
Success Rate (%)	-8.886071144	1.4338862	-6.19719413	1.46511E-07	-11.77233437	-5.999807922	-11.77233437	-5.999807922
Cashback Offers (Y/N)	0.50743682	0.291359827	1.741615599	0.088260001	-0.079040094	1.093913734	-0.079040094	1.093913734
Festival Season (Y/N)	0.398981208	0.327084087	1.219812348	0.228753312	-0.259404911	1.057367327	-0.259404911	1.057367327

Conclusion:

Model explains 85.7% of market share variation.

Avg. Transaction Value and Success Rate are significant predictors.

Both have a negative impact on market share.

Cashback Offers and Festival Season have no significant effect.

Regression (PhonePe):

Problem Statement: To analyze key drivers impacting PhonePe's **market share** using multiple linear regression.

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.877188224							
R Square	0.76945918							
Adjusted R Square	0.749412152							
Standard Error	1.355742341							
Observations	51							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	4	282.1953825	70.54884562	38.38270628	4.12083E-14			
Residual	46	84.54971556	1.838037295					
Total	50	366.745098						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1151.884406	192.2364094	-5.99201998	2.97663E-07	-1538.836228	-764.9325835	-1538.836228	-764.9325835
Avg. Transaction Value (₹)	0.010869186	0.003446367	3.153809706	0.002837726	0.003932009	0.017806362	0.003932009	0.017806362
Success Rate (%)	12.00738336	1.993050033	6.024627159	2.65977E-07	7.99558172	16.019185	7.99558172	16.019185
Cashback Offers (Y/N)	-0.475352592	0.441913114	-1.075669801	0.287684583	-1.364877554	0.414172371	-1.364877554	0.414172371
Festival Season (Y/N)	-0.089745667	0.495636154	-0.181071672	0.857106788	-1.087409501	0.907918166	-1.087409501	0.907918166

Conclusion:

Model explains 77% of market share variation.

Avg. Transaction Value and Success Rate are significant positive predictors.

Cashback Offers and Festival Season have no significant effect.

Model is statistically valid with strong overall fit.

Regression (final conclusion)

The regression analysis shows that for both Google Pay and PhonePe, success rate is a key driver of market share, highlighting the importance of reliability. However, average transaction value affects them differently, negatively for Google Pay and positively for PhonePe, indicating platform specific user behavior. Cashback offers and festival seasons had no significant impact, suggesting limited long-term influence of promotions. Therefore, both platforms should focus on boosting success rates and tailor transaction value strategies to their audience instead of relying heavily on seasonal incentives.

Hypothesis Testing (Two Sample T-Test):

Problem Statement: To determine if there's a significant difference in average transaction volume between Google Pay and PhonePe.

t-Test: Two-Sample Assuming Unequal Variances

	<i>Transaction Volume (₹M) Google Pay</i>	<i>Transaction Volume (₹M) PhonePe</i>
Mean	1756.470588	3114.117647
Variance	351407.2941	2282064.706
Observations	51	51
Hypothesized Mean Difference	0	
df	65	
t Stat	-5.974583272	
P(T<=t) one-tail	5.35433E-08	
t Critical one-tail	1.668635976	
P(T<=t) two-tail	1.07087E-07	
t Critical two-tail	1.997137908	

Null Hypothesis (H_0): There is no difference in the average transaction volume between Google Pay and PhonePe.

Alternative Hypothesis (H_1): There is a difference in the average transaction volume between Google Pay and PhonePe.

Conclusion: There is a significant difference in transaction values. PhonePe has a higher average transaction value than Google Pay. PhonePe appears to be more dominant in terms of user activity or merchant penetration, leading to higher transaction volumes, which could reflect greater market share or user engagement.

Hypothesis Testing (Chi Square-Test):

Problem Statement: To check if cashback offers on Google Pay and PhonePe are more likely effective during the festival season using the Chi-square test.

Google Pay

		Cashback Offers		
		Y	N	
Festival	Y	12	0	12
	N	22	17	39
		34	17	51

Expected Table

		Cashback Offers		
		Y	N	
Festival	Y	8	4	
	N	26	13	

Chi square test 7.84
Chi square critical 3.84

Cashback offers are **associated** with the festival season.

PhonePe

		Cashback Offers		
		Y	N	
Festival	Y	12	0	12
	N	23	16	39
		35	16	51

Expected Table

		Cashback Offers		
		Y	N	
Festival	Y	8.24	3.76	
	N	26.76	12.24	

Chi square test 7.15
Chi square critical 3.84

Cashback offers are **associated** with the festival season.

Hypothesis:

H_0 : Cashback offers are independent of whether it's a festival season.

H_1 : Cashback offers are associated with the festival season.

Conclusion: Cashback offers are associated with the festival season.

Recommendations



Optimize Promotional Timing (Festival-Driven, Not Cashback Focused): Focus marketing efforts during festival seasons and not necessarily on cashback.

Targeted Cashbacks: Limit to high-impact scenarios (MAU >80M + festival months)

Boost Rural Adoption: Increase merchant onboarding in rural areas (where count <5M)

Competitive Tactics:

Google Pay: Leverage higher urban transaction values

PhonePe: Reduce churn in low-activity user segments

Thank You!

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