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Analysis ofImpact of Demonetizationon Digital Transactions in India

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Abstract: *DemonetizationofRs 500 and Rs 1000 currency notes in India provided a fillip to the change towards digitization of transactions. Though, the overall success of demonetarization is still a debatable subject in academic and professional galleries. The present study focuses on the analyzing one of the objectives of demonetization that was to accelerate the growth in digital payment mechanism thereby shifting towards cashless regime. The findings of the study reveal that during the study period of 22 months, there has been a shift towards digital payment mechanism in post demonetization phase.*
Keywords: *Demonetization, NEFT, RTGS, Mobile transactions.*

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I. Introduction

Demonetization is an act of withdrawing the legal tender status of a currency unit in circulation. On November 8, 2016, Indian government banned the high denomination notes of Rs.500 and Rs.1000 as move to curb counterfeiting and money laundering *(bankbazar).*Thus, when demonetization was announced, the currency in circulation stood at Rs 17.97 lakh crore. 86 percent of this (Rs 15.45 lakh crore), was rendered invalid by demonetization*(Dugal, 2017).*In terms of value, Rs 500 notes constituted almost 45% of the currency in circulation while 39% of the notes were of the Rs 1,000 denomination*(Manish, 2016).*

Countries across the globe have used demonetization at some or the other point to control the situations like black money inflation and to boost economy. A snapshot of demonetization by a few countries is exhibited below.

TABLE 1

List of Countries that Exercised Demonetization

Country Name	Year	Objective	Results
Germany	1923	Due to high domestic prices	Inflation fell
USA	1969	Due to black money	Success
Britain	1971	To bring uniformity in currency	failed in other countries except Britain
Ghana	1982	To control black money	People turned to foreign currency
Nigeria	1984	To fix, debt burdened and inflation-ridden economy	Economy collapsed
Myanmar	1987	To curb black money	led political dispute and died thousands of people
Zaire	1990	A plan to withdraw obsolescent currency from the system	Failed
Soviet Union	1991	Fight against unearned income, smuggling and corruption	The economic system of the USSR was essentially crushed
Australia	1996	To the curb black money crisis and improve security features on the notes	Success
North Korea	2010	To lower down the market of black money	Miserably Failed
Zimbabwe	2010	Sliding out from Hyperinflation	Failed
Pakistan	2015	To get rid from Black Money, Counterfeit Currency	Messed Up
Philippines	2016	To preserve the integrity of currency	--

Source: Jagind&Sahu(2017), UGC Project Report Demonetization and Its Impact of Indian Economy

In Indian context, demonetization has been exercised three times. First was in pre independence era 1946. Second demonetization executed in the year 1978 and third is recent one in 2016. A snapshot two previous demonetization exhibited below.

TABLE 2

Past Demonetizations in India: A Snapshot

Year	Currencies Banned	Implications/Objective
1946	The currency note of Rs 1,000 and Rs 10,000 were removed from circulation. The pre-independence government hoped demonetisation would penalise Indian businesses that were concealing the fortunes amassed supplying the Allies in World War II.	The ban really did not have much impact, as the currency of such higher denomination was not accessible to the common people. However, both the notes were reintroduced in 1954 with an additional introduction of Rs 5,000 currency. The goal was to combat tax evasion by black money held outside the formal economic system.
1978	The then Prime Minister of India Morarji Desai announced the currency ban taking Rs 1000, Rs 5000 and Rs 10,000 out of circulation.	The sole aim of the ban was to curb black money generation in the country.

Source: compiled from https://en.wikipedia.org/wiki/2016_Indian_banknote_demonetisation and India's History with Demonetization retrieved from http://www.freepressjournal.in/featured-blog/indias-history-with-demonetisation-from-1946-to-2016/988212.

II. Demonetization in 2016: Some Aspects

On 8 November 2016 again, the Government of India announced demonetization of all 500 and 1000 banknotes of the Mahatma Gandhi Series. The government claimed that the action would curtail the shadow economy and crack down on the use of banned and fake cash to fund illegal activity and terrorism and promote cashless economy *(Wikipedia).*

Currencies in circulation: Table 3 indicates currencies in circulation in pre and post demonetization era. In March, 2016, proportion of Rs. 500 and Rs. 1000 was 86.4% in terms of value. In March 2015, share of both Rs. 500 and Rs. 1000 currency was 85.3 %.

TABLE 3

Banknotes in Circulation

	Volume (Million pieces)			Value(Billion)		
	March, 15	March, 16	March, 17	March, 15	March, 16	March, 17
2&5	11,672 (13.9)	11,626 (12.9)	11,557 (11.5)	46 (0.3)	45 (0.3)	45 (0.3)
10	30,304 (36.3)	32,015 (35.5)	36,929 (36.8)	303 (2.1)	320 (1.9)	369 (2.8)
20	4,350 (5.2)	4,924 (5.4)	10,158 (10.2)	87 (0.6)	98 (0.6)	203 (1.5)
50	3,487 (4.2)	3,890 (4.3)	7,113 (7.1)	174 (1.2)	194 (1.2)	356 (2.7)
100	15,026 (18.0)	15,778 (17.5)	25,280 (25.2)	1,503 (10.5)	1,578 (9.6)	2,528 (19.3)
500	13128 (15.7)	15707 (17.4)	5882 (5.9)	6564 (46.0)	7854 (47.8)	2941 (22.5)
1000	5,612 (6.7)	6,326 (7.0)	89 (0.0)	5,612 (39.3)	6,326 (38.6)	89 (0.7)
2000	--	--	3285 (3.3)	--	--	6571 (50.2)
TOTAL	**83,579**	**90,266**	**100,293**	**14,289**	**16,415**	**13,102**

Source: https://thewire.in/banking/demonetisation-99-of-scrapped-notes-came-back-into-system

Subsequently five months of demonetization, in March, 2017, proportion of Rs. 500 and Rs. 100 notes was reduced to 23.2%. This was because of introduction of new Rs. 2000 notes. Proportion of Rs. 2000 notes in Mach 2017 was about 50%. As on November 4, total currency in circulation was Rs. 17.97 lakh crore. Withdrawn Currency as a result of demonetarization was Rs. 15.45 lakh crore. On June 30, 2017, total returned currency was Rs. 15.28 lakh crore*(Dugal, 2017).*In terms of volume, 10 and 100 banknotes constituted 54.3% of

total banknotes in circulation at the end of March 2015 and 53.0% at end-March 2016, as compared to 62% in March, 2017.

Statewise ranking on the basis of cashless transactions: Scorecard created by a personal finance app Walnut revealed ranking of states on the basis of percentage increase in overall cashless transactions, growth in shoppers using debit or credit card for the first time and growth in merchants accepting digital payments.

TABLE 4

Statewise Ranking in Context of Cashless Transactions

1. Gujrat	11. Rajasthan	21.Odissa
2. Telangana	12. Karnataka	22. Bihar
3. Haryana	13. Tamil Nadu	23. Madhya Pradesh
4. Uttar Pradesh	14. Jharkhand	24. Nagaland
5. Delhi	15. Meghalaya	25. Arunachal
6. Himachal	16. Assam	26. Mizoram
7. Uttarakhand	17. Kerala	27. Tripura
8. Punjab	18. Goa	28. Manipur
9. Andhra Pradesh	19. West Bengal	29.Jammu & Kashmir
10. Maharashtra	20. Chhattisgarh	

Source: https://www.indianweb2.com/2017/01/26/gujarat-telangana-haryana-rank-among-top-3-states cashless-india-scorecard/

The ranking indicated in table 4 was based upon over 5 million users of a personal finance app exhibiting how each state moving towards cashless economy.Astonishingly, one of the most industrialized states in the country, Maharashtra, ranks 10th on the list, while Delhi stands fifth According to ranking, Gujrat, Telangana and Haryana ranked as top three states. Jammu & Kashmir was the last state while implementing cashless modes of transactions *(Das, 2017).*Before demonetization move in November 2016, cash accounted for 96% of the monetary transactions in the country*(M Wallet Report, 2016).*

Key issues in going cashless:

According to latest figures (As on 31st January, 2018) from the Indian telecom regulator,India has a teledensity(Teledensityindicates the number of telephones per 100 population, is an indicator of telecom penetration in the country) of 90.61%, with Bihar, Assam and Madhya Pradesh with teledensity of less than 70%. One of the notable points is, there are number of connections, not users, so it has to be discounted significantly to arrive at true conclusion because many users have multiple SIM cards. Further, availability of reliable connectivity particularly in remote areas,insufficient point of sale machines (According to Ernst and Young report 2015, India has the dubious honour of having one of the lowest POS terminal penetration, with only 693 machines per million. Brazil had 32,995 terminals per million people and China and Russia had around 4000 terminals per million people*),* concentration of POS in major cities etc. are important issues to be tackled *(Pahwa, 2016).*As on 31st January, 2018, Delhi has a teledensity of 252.73%. Urban wireless teledensity is 159.39%, and rural is 56.25% *(TRAI Press release, 2018)*. To ensure a safe cashless system, there is a need to build a robust cyber security framework and governance structure to alleviate the risk of cyber-attacks. The key lies in creating an ecosystem that helps us constantly stay alert *(Anand, 2017).*

However, overall scenario seems to be supportive toward digital transactions, particularly mobile based transactions future prospects seem to be promising. In FY 2016, India m-payment reported INR 8.2 Trillion worth of transaction value; and it is expected that it would grow at a CAGR of 150% during FY 2016 to FY 2022, reaching INR 2205 Trillion *(M Wallet Report, 2016).*

III. Objective and Hypothesis of the Study

Demonetization, besides having other objectives, also has implied objective towards promoting cashless transactions that was supposed to act as catalyst in transformation the behavior of the people while dealing in monetary transactions. Further, a shift towards digital transaction is expected to curb black money and corruption.

Though demonetization was introduced with many intentions, the objective and scope of this study is limited to the extent of exploringwhether the move of demonetization fetchednoteworthy change in the volume of digital transactions by comparing pre demonetization and post demonetization figures released by Reserve bank of India. Comparison was based on the basis of transaction through three different modes namely; NEFT, RTGS and mobile transactions. To serve the purpose, null hypotheses have been outlined as:

I. **Null Hypothesis (Ho)**: There is no significant difference between volume of transactions through NEFT during pre and post demonetization period.

II. **Null Hypothesis (Ho)**: There is no significant difference between volume of transactions through RTGS during pre and post demonetization period.
III. **Null Hypothesis (Ho)**: There is no significant difference between volume of transactions through mobile transactions during pre and post demonetization period.

To compare the slopes of different mode of digital transactions, hypotheses have been outlined as:

IV. **Null Hypothesis (Ho)**: There is no difference between slopes of NEFT in pre demonetization and NEFT in post demonetization phase.
V. **Null Hypothesis (Ho)**: There is no difference between slopes of RTGS in pre demonetization and RTGS in post demonetization phase.
VI. **Null Hypothesis (Ho)**: There is no difference between slopes of Mobile transactions in pre demonetization and mobile transactions in post demonetization phase.

IV. Research Design

Nature of study: The study is analytical in nature.
Nature and sources of data: Data used for justification of above objective is secondary in nature. The data has been collected from RBI and various concerned websites.
Duration: For the purpose of analyzing post impact of demonetization, 22 months (January, 2016 to October, 2017) data on NEFT, RTGS and Mobile transactions have been collected. In context of observing circulation of currencies in pre and post demonetization phase, data for the month of March 15, March 16, and March 17 has been used.

Methodology: In order to serve above mentioned hypotheses, data concerned with NEFT, RTGS and Mobile transactions for the period January, 2016 to October, 2017 (22 months) have been sub divided in two phases i.e., from January, 2016 to November, 2016 and December,2016 to October, 2017. Thus, size of each sample (January, 2016 to November, 2016 and December, 2016 to October, 2017) is being less than 30; t-test has been employed individually on three different mode of digital transaction. Before exposing the data for t-test, the compliance of necessary conditions; normality of data and homogeneity of variances have also been ensured. Further, slopes of RTGS, NEFT and mobile transaction during pre and post demonetization have also been compared together to observe whether different modes of digital transaction have same trend during pre and post demonetization phase.

V. Result

Table 5 indicates data collected from RBI Report on digital transactions. Findings and discussions are in context of data exhibited in table 5.

TABLE 5

Monthwise Digital Transactions during Pre and Post Demonetization Phase

Pre Demonetization			**Post Demonetization**		
NEFT Jan'16 to Nov.'16	**RTGS Jan'16 to Nov.'16**	**Mobile Transactions Jan'16 to Nov.'16**	**NEFT Dec.'16 to Oct. 17**	**RTGS Dec.'16 to Oct. 17**	**Mobile Transactions Dec.'16 to Oct. 17**
(Million)	(Million)	(Million)	(Million)	(Million)	(Million)
118.97	8.22	42.80	166.31	8.84	110.64
110.17	8.22	44.65	164.19	9.33	106.13
129.24	9.86	49.47	148.21	9.10	95.41
111.84	8.32	48.67	186.70	12.53	113.65
117.50	8.70	61.73	143.17	9.54	106.27
118.29	8.46	63.17	155.82	10.43	114.26
113.48	8.25	67.47	152.34	9.82	115.73
118.56	8.55	71.76	148.14	9.38	103.25
120.15	8.46	72.63	151.61	9.45	97.89
133.21	9.00	78.12	157.67	9.60	113.43
123.05	7.87	87.47	158.78	9.99	147.82

Source: RBI Report

It can be observed from table 6 that in case of all modes of digital payment, average volume of transaction was higher in post demonetization phase as compared to pre demonetization phase.

TABLE 6						
Descriptive Statistics						
	NEFT Jan'16 to Nov.'16	**NEFT Dec.'16 to Oct. 17**	**RTGS Jan'16 to Nov.'16**	**RTGS Dec.'16 to Oct. 17**	**Mobile Transactions Jan'16 to Nov.'16**	**Mobile Transactions Dec.'16 to Oct. 17**
Mean	119.496	157.540	8.537	9.819	62.540	111.316
Median	118.56	155.82	8.46	9.54	63.17	110.64
Standard Deviation	6.960	11.917	0.527	0.996	14.661	13.863
Coefficient of Variation	5.825	7.564	6.174	10.144	23.442	12.453
Geometric Mean	119.316	157.152	8.523	9.778	60.949	110.610
Skewness	0.747	1.502	1.687	2.296	0.112	1.906
Kurtosis	0.276	3.024	3.753	6.162	-1.056	5.157
Source: computed data						

However, fluctuations in volume of transactionsobserved to be high in post demonetization phase as compared to pre demonetization phase except transactions by mobile as indicated by coefficient of variations.
In context of hypothesis I, II and III, before conducting t test to compare the impact of demonetization on different modes of digital transaction, compliance with test for normality and test for equality of variances has been conducted to avoid any dubious interpretation.Table 7 to table 9 exhibited below is in context of I, II and III hypothesis.

TABLE 7						
Normality Test (Anderson-Darling Test)						
	NEFT Jan'16 to Nov.'16	NEFT Dec.'16 to Oct. 17	RTGS Jan'16 to Nov.'16	RTGS Dec.'16 to Oct. 17	Mobile Transactions Jan'16 to Nov.'16	Mobile Transactions Dec.'16 to Oct. 17
P value	0.8236	0.6800	0.4662	0.2625	0.9268	0.3910
Pass normality test(p>.05)?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Source: computed data						

Table 7 indicates in all cases p value is observed to be higher than 0.05, which indicates that the sample data chosen for the study complies with the condition of normality.
To test equality of variances, concerned hypothesis is formulated as:
H_0: The ratio between the variances is equal to 1.
H_1: The ratio between the variances is different from 1.

TABLE 8			
Equality of Variance			
	NEFT Jan'16 to Nov.'16 **Vs.** Dec.'16 to Oct. 17	**RTGS** Jan'16 to Nov.'16 **Vs.** Dec.'16 to Oct. 17	**Mobile Transactions** Jan'16 to Nov.'16 **Vs.** Dec.'16 to Oct. 17
Difference of variance	-93.56	-0.714	22.760
F value	0.341	0.280	1.118
F, Critical	3.717	3.717	3.717
P value	0.105	0.057	0.863
Are the variances different (p<0.05)?	No	No	No
One or two-tailed?	Two-tailed	Two-tailed	Two-tailed
H_0	**Accepted**	**Accepted**	**Accepted**
Significance level at 95%			
Source: computed data			

Results exhibited in table 8 indicatethat computed p-value is greater than the significance level alpha=0.05. Therefore, it can be concluded that there is no significant difference between variances of digital transactions in two different phases.

To conduct t test in context of similarity of means, following hypothesis has been formulated for all three modes digital payment system.
H_0: The difference between the means is equal to 0.

H_1: The difference between the means is different from 0.

TABLE 9				
Independent Samples Test				
		NEFT Jan'16 to Nov.'16 **Vs.** Dec.'16 to Oct. 17	**RTGS** Jan'16 to Nov.'16 **Vs.** Dec.'16 to Oct. 17	**Mobile Transactions** Jan'16 to Nov.'16 **Vs.** Dec.'16 to Oct. 17
Difference of means		-38.044	-1.282	-48.776
t value		9.143	3.772	8.018
t, critical		2.086	2.086	2.086
p value		< 0.0001	0.0012	< 0.0001
95% Confidence interval of the difference	Lower	-46.723	-1.991	-61.466
	Upper	-29.364	-0.573	-36.086
Are the means different (p<0.05)?		Yes	Yes	Yes
One or two-tailed?		Two-tailed	Two-tailed	Two-tailed
H_0		**Rejected**	**Rejected**	**Rejected**
Significance level at 95%				
Source: computed data				

As the computed p-value is lower than the significance level alpha=0.05, therefore, null hypothesis has been rejected(H_0,) and alternativehypothesis ($H_{1)}$ has been accepted.

Another dimension of analysis is comparing the slopes of pre demonetization phase and post demonetization phase of NEFT, RTGS and monetary transactions. Hypothesis IV, V and VI reproduced as:

H_0: $\beta_1 = \beta_2$ i.e. $\beta_1 - \beta_2 = 0$

There is no difference between slopes of NEFT in pre demonetization and NEFT in post demonetization phase.

H_0: $\beta_1 = \beta_2$ i.e. $\beta_1 - \beta_2 = 0$

There is no difference between slopes of RTGS in pre demonetization and RTGS in post demonetization phase.

H_0: $\beta_1 = \beta_2$ i.e. $\beta_1 - \beta_2 = 0$

There is no difference between slopes of Mobile transactions in pre demonetization and Mobile transactions in post demonetization phase.

Table 10 to table 12 is in context of IV, V and VI hypothesis.

TABLE 10		
NEFT		
	No Pool	Pooled
Standard error	1.306	1.306
T	1.505	1.505
Df	18	18
p value	0.149	0.149
H_0	**Accepted**	**Accepted**
Source: computed data		

P value higher than 0.05 depicted in table 10 confirms acceptance of null hypothesis thereby concluding that there is no significant difference between slopes of NEFT in pre and post demonetization period.Thus there is no significant change in slope except in terms of volume of NEFT transactions in pre and post demonetization phase. The same can be observed by the trend line depicted in figure 1 below.

Figure 1

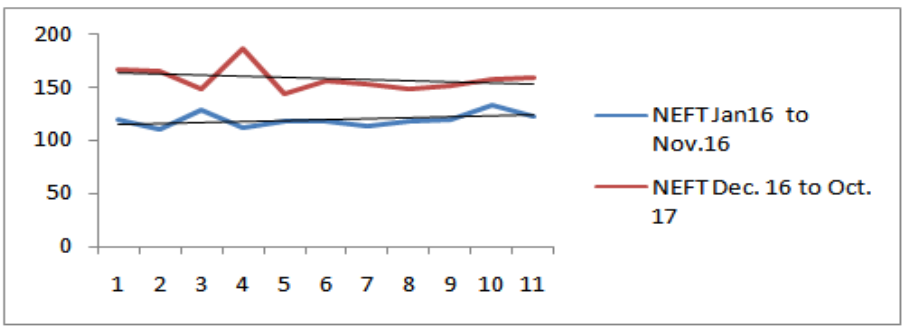
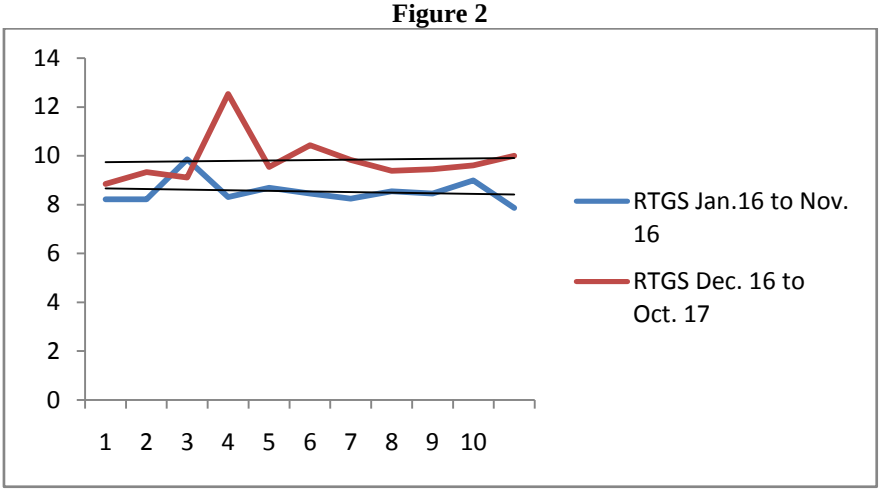


TABLE 11		
RTGS		
	No Pool	Pooled
Standard error	0.112798039	0.112798
T	-0.377182573	-0.37718
Df	18	18
p value	0.710448075	0.710448
H_0	**Accepted**	**Accepted**
Source: computed data		

Results depicted in table 11 indicate approval of null hypothesis thereby concluding that there is no significant difference between slopes of RTGS pre and post demonetization phase with corresponding p value more than 0.05. Figure 2 exhibited below depict the identical observation.

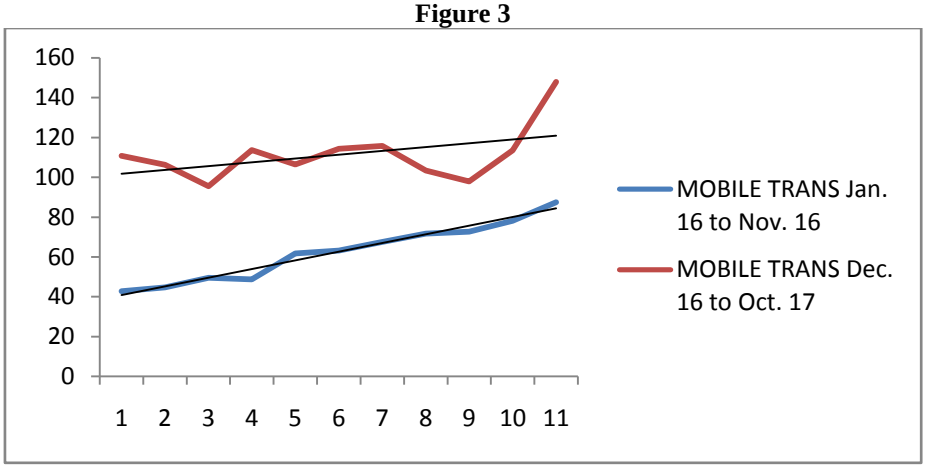
Figure 2



In context of mobile transactions, table 12 with corresponding value p value more than 0.05 indicates there is no significant difference between slopes during pre and post demonetization periods. Though an increase has been observed in volume of transactions in post demonetization as compared to pre demonetization phase, but direction observed to be almost same. Figure 3 depicted below indicate similar observation.

TABLE 12		
MOBILE TRANSACTIONS		
	No Pool	Pooled
Standard error	1.264499	1.264499
T	1.922644	1.922644
Df	18	18
p value	0.070495	0.070495
H_0	**Accepted**	**Accepted**
Source: computed data		

Figure 3



VI. Conclusion

The above findings clearly indicate and statistically prove that the volume of financial transactions generated in the months subsequent to the announcement of demonetization of currency notes are significantly different than those which occurred in the period prior to it.Thus the results highlight that how Indian citizens have adapted themselves to new kind of financial system. However, while comparing slopes of pre and post demonetization phase, post demonetization trend does not exhibit sharp rise in RTGS, NEFT and mobile transactions. Above findings are in context of short span of time i.e., 22 months. Demonetization is not supposed to bring sustained shift towards digital transaction. In order to bring permanent change toward cashless transactions, continuous education, awareness and technological innovations accompanied by sustainable digital payment ecosystem is a crucial concern.

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