

Impact of Digital Payment Systems in Public Transport

Mr. Raju Nathu Chauhan

Assistant Professor, Department of Commerce
Smt. P.N. Doshi Women's College, Ghatkopar, Mumbai
raju.chauhan24@yahoo.in

Abstract: *This study looks at how digital payments are changing the experience of travelling by public transport for urban commuters. It focuses on UPI, smart cards, mobile wallets, and QR code payments. The study draws on responses from 150 commuters collected through a structured questionnaire. Percentage analysis and a Chi-square test were used to examine digital payment use in relation to commuter satisfaction, age, and education level.*

The findings suggest that commuters generally welcome digital payments because they make paying fares quicker, easier, and more transparent. UPI was the most preferred option. Respondents also reported less waiting time and greater convenience, along with fewer difficulties associated with carrying cash. However, poor internet connectivity, limited digital literacy among some senior citizens, and security concerns remain challenges.

Overall, the study finds that digital payments can improve the efficiency of public transport services and commuter satisfaction while supporting the wider use of cashless transactions.

Keywords: Digital Payment Systems, Public Transport, UPI, Commuter Satisfaction, Cashless Economy, Urban Commuters, Digital Transactions, Transport Efficiency

I. INTRODUCTION

Digital technology has changed the way people make payments across the world. In India, initiatives such as Digital India and demonetization encouraged the use of digital payments. UPI, mobile wallets, QR codes, and contactless cards are now common in everyday transactions. Public transport is one area where these methods are gradually becoming an alternative to cash.

Public transport is essential to daily travel in cities. Thousands of people use buses, metros, local trains, and auto-rickshaws each day. Cash payments can create difficulties for passengers and operators, including a shortage of change, delays in ticketing, and limited records of fare collection. Digital payment and ticketing systems may help address some of these problems.

For commuters, digital payments can make fare payment quicker and more convenient. Contactless payment also became particularly useful during the COVID-19 pandemic. Many transport services now offer options such as smart cards, QR code payments, and online tickets. Their use, however, depends on reliable internet access, digital skills, and confidence in the security of the system. Some passengers may also prefer the payment methods they already know.

This paper examines the use of digital payments in public transport. It focuses on commuters' experiences, their acceptance of these payment methods, and the benefits and difficulties they encounter.

II. REVIEW OF LITERATURE

Research on digital payments points to their growing role in everyday transactions and public services. Wider smartphone use, improvements in payment technology, and government initiatives have all contributed to this growth.

Reserve Bank of India (RBI) reports (2022) describe the rise in digital transactions in India, particularly through UPI. This wider pattern provides context for studying whether commuters are also choosing digital methods for travel expenses.

Sharma (2022) observed that access to digital payments differs across population groups. Low digital literacy, weak internet connectivity, and limited awareness can make these systems harder to use, especially in rural and semi-urban areas. The study shows why the availability of a payment option does not necessarily mean that everyone can use it easily.

Meena (2021) examined smart cards in metro rail services and reported improvements in the ticketing process. The study suggests that digital ticketing can shorten queues and save commuters time when the system is simple and works reliably.

A World Bank report (2020) discussed how digital payments can improve transaction records and accountability in public services. In public transport, clearer fare records may help authorities manage collections and give passengers greater confidence in the payment process.

Kumar and Singh (2019) linked the growth of digital payments in India to government policies, promotional efforts, and increasing smartphone use. Their work suggests that adoption is shaped by social and policy factors as well as the technology itself.

Dahlberg et al. (2015) identified convenience and speed as reasons people adopt mobile payments. They also noted the importance of trust and security in continued use. These concerns are relevant to commuters, who need payment methods that are both quick and dependable.

Rogers' (2003) Diffusion of Innovations theory offers a way to understand how people adopt new technologies. Applied to public transport, it suggests that commuters may be more willing to use digital fare payments when they see a clear benefit in their daily journeys.

Together, these studies suggest that digital payments can make transactions faster and more convenient, while improving records of fare collection. They also point to barriers such as poor connectivity, limited digital skills, and security concerns. Much of the literature discusses digital payments broadly, so it is useful to examine how these issues affect urban public transport commuters specifically. The present study therefore explores digital payment use, commuter satisfaction, and the practical benefits and challenges of these systems in public transport.

III. OBJECTIVES OF THE STUDY:

- To examine the level of adoption of digital payment systems in public transport.
- To analyse the impact of digital payments on commuter convenience and satisfaction.
- To identify the challenges faced by commuters while using digital payments.
- To evaluate the overall effectiveness of digital payment systems in public transport.

IV. HYPOTHESES

Hypothesis 1: Age and Digital Payment Preference

H₀₁ (Null): There is no significant relationship between commuters' age and their preference for digital payments in public transport.

H₁₁ (Alternative): There is a significant relationship between commuters' age and their preference for digital payments in public transport.

Hypothesis 2: Digital Payment Use and Commuter Satisfaction

H₀₂ (Null): The use of digital payments in public transport has no significant relationship with commuter satisfaction.

H₁₂ (Alternative): The use of digital payments in public transport has a significant relationship with commuter satisfaction.

Hypothesis 3: Education Level and Digital Payment Use

H₀₃ (Null): There is no significant association between commuters' education level and their use of digital payments in public transport.

H₁₃ (Alternative): There is a significant association between commuters' education level and their use of digital payments in public transport.

V. SCOPE OF THE STUDY

This study focuses on digital fare payments in urban public transport, including buses, metros, and local trains. It examines commuters' experiences with UPI, QR code payments, mobile wallets, and smart cards. The study is limited to urban commuters and does not cover rural transport services. Its findings may help identify areas where digital payment facilities in public transport could be improved.

VI. RESEARCH METHODOLOGY

The study uses both primary and secondary data. Primary data was collected through a structured questionnaire from 150 regular public transport commuters, selected through convenience sampling. The respondents included students, working professionals, and senior citizens.

Secondary data was drawn from journals, research papers, RBI reports, government publications, and relevant websites. The questionnaire included closed-ended and Likert scale questions about payment use, commuter experience, and satisfaction. The responses were presented in tables and analysed using percentages and Chi-square tests.

VIII. TOOLS AND TECHNIQUES USED FOR ANALYSIS

Percentage analysis: Used to describe respondents by age, education level, and preferred payment method.

Chi-square test: Used to examine associations between selected variables, including demographic characteristics and digital payment use.

Likert scale analysis: Used to summarise commuters' views on convenience, speed, security, transparency, and satisfaction.

Tabulation: Used to present the responses clearly and make comparisons easier.

IX. RESEARCH ANALYSIS

Table No. 1: Mode of Payment Used in Public Transport

Mode of Payment	Number of Respondents	Percentage
Cash	45	30%
UPI	60	40%
Smart Card	30	20%
Mobile Wallet	15	10%
Total	150	100%

Source: Primary Data, Computed by Researcher using SPSS

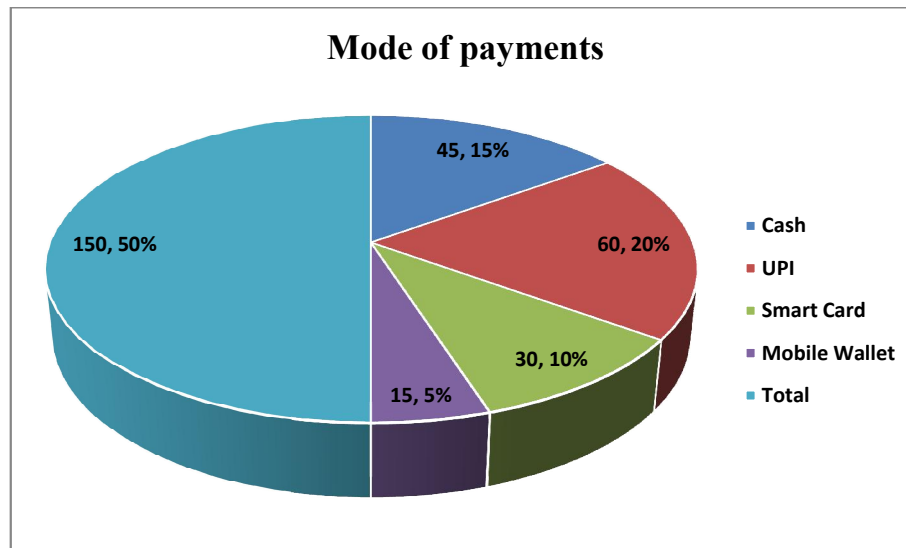


Figure No. 1: Mode of Payment Used in Public Transport

Table No. 1 shows the payment methods preferred by the 150 respondents for public transport fares. UPI was the most common choice, preferred by 60 respondents (40%). Another 30 respondents (20%) preferred smart cards, while 15 (10%) preferred mobile wallets. Cash remained the preferred option for 45 respondents (30%).

Together, the three digital methods were preferred by 105 respondents (70%). This suggests that digital payments are popular among the commuters surveyed, although cash remains an important option.

Table No. 2: Satisfaction Level with Digital Payment

Satisfaction Level	Respondents	Percentage
Highly Satisfied	50	33%
Satisfied	60	40%
Neutral	20	13%
Dissatisfied	15	10%
Highly Dissatisfied	5	4%

Source: Primary Data, Computed by Researcher using SPSS

Table No. 2 presents respondents' satisfaction with digital payments in public transport. Of the 150 respondents, 60 (40%) were satisfied and 50 (33%) were highly satisfied. Another 20 (13%) gave a neutral response. Meanwhile, 15 (10%) were dissatisfied and 5 (4%) were highly dissatisfied.

Overall, 110 respondents reported being satisfied or highly satisfied, suggesting a generally positive experience with digital payments among those surveyed.

Table No. 3: Challenges Faced

Challenge	Respondents	Percentage
Network Issues	55	37%
Server Failure	30	20%
Lack of Digital Literacy	25	17%
Security Concerns	20	13%
No Challenges	20	13%

Source: Primary Data, Computed by Researcher using SPSS

Table No. 3 shows the problems respondents faced when using digital payments in public transport. Network problems were reported most often, by 55 of the 150 respondents (about 37%). Server failures were reported by 30 respondents

(20%), followed by difficulty using digital payment systems among 25 respondents (about 17%). Security concerns were reported by 20 respondents (about 13%), while another 20 (about 13%) said they had faced no problems. Network and server issues together accounted for 85 responses, making technical difficulties the most commonly reported challenge.

HYPOTHESIS TESTING:

HYPOTHESIS 1

H₀₁: There is no significant relationship between age and preference for digital payment in public transport.

Table No. 4: Age × Digital Payment Preference

Age Group	Digital Payment (Yes)	Digital Payment (No)	Total
18–30 Years	50	10	60
31–50 Years	35	20	55
51+ Years	20	15	35
Total	105	45	150

Source: Primary Data, Computed by Researcher using SPSS

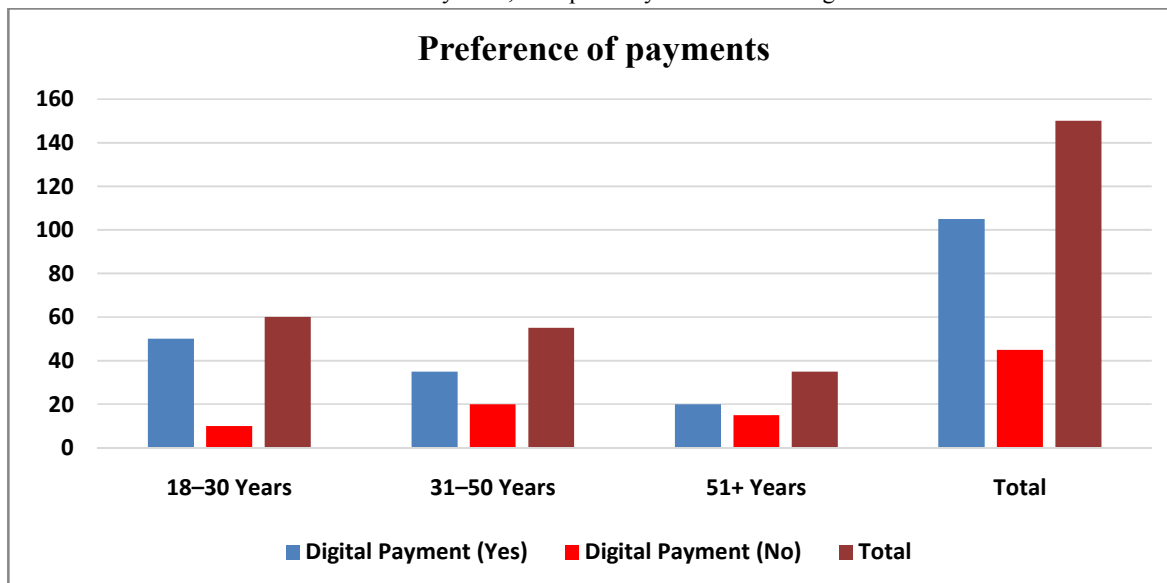


Figure No. 2 Digital Payment Preference

Table No.5: Chi-Square Tests

Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.895	2	0.012
Likelihood Ratio	8.642	2	0.013
N of Valid Cases	150		

Source: Primary Data, Computed by Researcher using SPSS

The Pearson Chi-Square value is 8.895 with 2 degrees of freedom. The significance value ($p = 0.012$) is less than 0.05.

Since $p < 0.05$, the null hypothesis is rejected.

There is a statistically significant relationship between age and digital payment preference in public transport. Younger commuters are more likely to adopt digital payment systems compared to older age groups.

HYPOTHESIS 2

H₀₂: Digital payment systems do not significantly improve commuter satisfaction.

For testing this hypothesis, a Chi-square test was conducted between:

Digital Payment Usage (Yes/No)

Satisfaction Level (Satisfied / Not Satisfied)

Table No. 6: Digital Payment Usage × Satisfaction

Digital Payment Usage	Satisfied	Not Satisfied	Total
Yes	80	25	105
No	30	15	45
Total	110	40	150

Source: Primary Data, Computed by Researcher using SPSS

Table No. 6: Chi-Square Tests

Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.862	1	0.027
Likelihood Ratio	4.745	1	0.029
N of Valid Cases	150		

Source: Primary Data, Computed by Researcher using SPSS

The Chi-square value is **4.862** with **1 degree of freedom**. The significance value is **0.027**, which is less than 0.05.

Since $p < 0.05$, the null hypothesis is rejected.

Digital payment usage significantly improves commuter satisfaction. Users of digital payment systems report higher satisfaction levels compared to cash users.

HYPOTHESIS 3

H₀₃: There is no significant association between education level and usage of digital payments.

Table No. 7: Education Level × Digital Payment Usage

Education Level	Digital Payment (Yes)	Digital Payment (No)	Total
Below Graduate	25	20	45
Graduate	50	15	65
Postgraduate	30	10	40
Total	105	45	150

Source: Primary Data, Computed by Researcher using SPSS

Table No. 8: Chi-Square Tests

Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.274	2	0.010
Likelihood Ratio	9.115	2	0.011
N of Valid Cases	150		

Source: Primary Data, Computed by Researcher using SPSS

The Chi-square value is **9.274** with **2 degrees of freedom**. The significance value is **0.010**, which is less than 0.05.

Since $p < 0.05$, the null hypothesis is rejected.

There is a significant association between education level and digital payment usage. Higher educational qualification increases the likelihood of adopting digital payment systems.

X. FINDINGS OF THE STUDY

UPI was the most preferred payment method, chosen by 60 of the 150 respondents (40%).

In total, 105 respondents (70%) preferred a digital payment method, while 45 (30%) preferred cash.

Most respondents were satisfied with digital payments: 110 (about 73%) said they were satisfied or highly satisfied.

Network problems were the most frequently reported difficulty, mentioned by 55 respondents (about 37%). Server failures were reported by another 30 (20%).

Twenty-five respondents (about 17%) reported difficulty using digital payment systems, and 20 (about 13%) raised security concerns.

The available tables do not establish whether age or education affects payment choice, or whether digital payments cause higher satisfaction. Those points should be reported only after the relevant questionnaire responses and statistical test results are presented. The same applies to claims about time saved, contactless safety, fare transparency, and reduced cash handling.

XI. SUGGESTIONS

Improve the reliability of digital payment facilities in buses, stations, and ticketing areas, with particular attention to network and server problems.

Assess whether suitable payment options can work when internet connectivity is weak.

Provide clear instructions and assistance for commuters who find digital payments difficult to use, including senior citizens.

Display simple guidance on safe payments and how to report a suspicious transaction.

Set up a clear process for failed payments, refunds, and complaints.

Consider connecting ticket payment and live travel information in transport apps where this would be practical.

XII. LIMITATIONS OF THE STUDY

The study includes 150 respondents, all of whom are urban public transport commuters. Its findings cannot be assumed to apply to rural services.

Respondents were selected through convenience sampling, so the sample may not represent all urban commuters.

The findings rely on respondents' answers, which may be affected by recall or personal opinion.

The study describes commuters' experiences at the time of the survey. Payment systems and usage patterns may change.

Without operational records, the study cannot directly measure changes in transport efficiency, revenue collection, or actual waiting time.

XIII. CONCLUSION

The survey suggests that digital payments are a popular option among the urban commuters studied. Seventy per cent preferred a digital payment method, with UPI the most common choice. Most respondents also reported being satisfied or highly satisfied with digital payments.

The findings point to practical difficulties that transport providers need to address. Network problems and server failures were the most common complaints, while some respondents reported difficulty using digital payments or concerns about security. Improving reliability, providing assistance, and handling failed transactions promptly could make these systems easier to use.

As the study used a convenience sample and self-reported responses, its findings describe the experiences of the commuters surveyed. Claims that digital payments improve transport efficiency or cause greater satisfaction would require further evidence.

REFERENCES

1. Reserve Bank of India. (2022). *Annual report on digital payments 2021–22*. Reserve Bank of India.
2. Sharma, A. (2022). Challenges in digital payment adoption: Evidence from India. *Journal of Financial Technology Research*, 8(1), 78–89.
3. Meena, S. (2021). Smart card systems in metro services and their operational efficiency. *Journal of Urban Transport Studies*, 6(2), 112–120.
4. World Bank. (2020). *Digital financial services and development*. World Bank Publications.
5. Kumar, R., & Singh, P. (2019). Digital payment adoption in India: Trends and challenges. *International Journal of Innovative Research in Management Studies*, 4(3), 45–52.
6. Dahlberg, T., Guo, J., & Ondrus, J. (2015). A critical review of mobile payment research. *Electronic Commerce Research and Applications*, 14(5), 265–284. <https://doi.org/10.1016/j.elerap.2015.07.006>
7. Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press