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SURVEY ON PAYMENT METHODS IN PUBLIC TRANSPORT

Prof. Mrs. A.S. Narote[*1], Ketan Sawant[*2], Abhijeet Savable[*3], Soham Sable[*4], Ganesh Shelar[*5]

[*1]Assistant Professor, Department Of Information Technology Engineering, Smt. Kashibai Navale College Of Engineering, Pune, India.

[*2,3,4,5]Department Of Information Technology Engineering, Smt. Kashibai Navale College Of Engineering, Pune, India.

Affiliated To Savitribai Phule Pune University, India.

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ABSTRACT

This research paper presents a comprehensive survey of payment methods employed in public transport systems worldwide. As urban populations continue to grow, efficient and seamless payment solutions are essential for enhancing the overall user experience in public transportation. The study investigates various payment mechanisms currently in use, analyzes their strengths and weaknesses, and explores emerging trends shaping the future of fare collection in public transit. The research employs a multi-faceted methodology, incorporating literature reviews, case studies, and surveys conducted across diverse metropolitan areas. Through a systematic analysis of existing payment infrastructures, the paper identifies key challenges faced by commuters and transportation authorities alike, including issues related to accessibility, affordability, and technological integration. Furthermore, it assesses the impact of digital advancements on fare collection, such as contactless smart cards, mobile applications, and innovative biometric authentication methods. The findings reveal insights into the preferences and satisfaction levels of commuters regarding different payment modalities. Additionally, the paper explores the implications of transitioning from traditional ticketing systems to more advanced, technology-driven alternatives. The discussion encompasses the economic, social, and environmental aspects associated with adopting modern payment solutions in public transportation. By shedding light on the current landscape of payment methods in public transport and anticipating future developments, this research contributes to the ongoing dialogue surrounding urban mobility. The paper concludes with recommendations for policymakers and transit authorities to enhance payment systems, fostering a more inclusive, efficient, and user-friendly public transportation experience for all.

Keywords: Payment Methods, Public Transport, Fare Collection, Digital Advancements, Urban Mobility.

I. INTRODUCTION

Public transportation plays a pivotal role in the sustainable development of urban areas, offering an efficient means of mobility for millions of individuals daily. As cities continue to evolve and grapple with burgeoning populations, the need for seamless and user-friendly payment methods within public transport systems becomes increasingly apparent. This research paper delves into the intricate landscape of payment methods in public transport, aiming to provide a comprehensive understanding of the current state of fare collection mechanisms and anticipate the trajectory of future advancements. The efficiency and accessibility of payment systems significantly influence the overall transit experience, impacting commuters' daily routines and shaping their perceptions of public transportation. Traditional ticketing methods, while familiar, often face challenges related to convenience, affordability, and adaptability to technological innovations. In response to these challenges, transit authorities worldwide are exploring and implementing novel payment solutions that leverage cutting-edge technologies to enhance the ease and efficiency of fare collection. This research endeavors to shed light on the diverse array of payment methods employed in public transport systems globally. Through a meticulous examination of existing literature, case studies, and survey data, we aim to identify the strengths and weaknesses of different payment modalities. Additionally, we seek to understand the preferences and satisfaction levels of commuters, exploring the impact of these preferences on the broader urban mobility landscape. With the advent of digital technologies, the transportation sector is witnessing a paradigm shift in the way fares are collected. Contactless smart cards, mobile applications, and biometric authentication methods are among the innovative solutions reshaping the payment ecosystem in public transit.

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This paper not only evaluates the implications of these technological advancements but also considers the socio-economic and environmental dimensions associated with the evolution of payment methods in the context of public transportation. Through this exploration, we aspire to contribute valuable insights that inform policymakers, transit authorities, and stakeholders in the ongoing efforts to create more inclusive, efficient, and user-centric public transportation systems. By understanding the current challenges and anticipating future trends in payment methods, we aim to facilitate the development of strategies that enhance the overall quality of urban mobility, ensuring that public transport remains a viable and attractive option for all.

II. LITERATURE SURVEY

In this research paper[1], the authors explore the escalating usage of mobile payment apps, also known as digital payment apps, and their impact on customer satisfaction. It highlights the surge in users and the widespread adoption of various apps for UPI payments like Google Pay, PhonePe, and Paytm. With a sample size of 120 customers, the study employs a descriptive research design and primary data sources to understand customer behavior. Through simple percentage analysis, chi-square tests, and ANOVA tests, the study interprets customer satisfaction and usage patterns, presenting findings via pie charts and graphs. Introduction contextualizes the rise of digital payment systems in India, spurred by the government's "Digital India" initiative aiming for a faceless, paperless, and cashless society. Post-demonetization, efforts to encourage digital transactions include discounts, UPI, and upcoming platforms like USSD for mobile banking without internet. This digital transformation has significantly boosted the country's digital payment landscape. The term "digital payment" encompasses transactions conducted through internet or mobile banking, including card payments or smartphone-based payments at point-of-sale (POS). The growing reliance on the internet has prompted customers to seek quicker banking methods, leading to the widespread adoption of digital payment systems. While urban populations have embraced online payment apps, the study notes a lower adoption rate in rural areas, where awareness and understanding of these platforms remain limited. The research underscores the success of online payment apps in streamlining transactions, reducing risks, and catering to the needs of digitally inclined users in today's tech-driven era. In this paper [2], the authors delve into the impact of QR code mobile payment on bus boarding service time (BST) in China. It explores how this payment method, popular since 2017, affects passenger boarding efficiency. Compared to traditional methods like cash or IC cards, QR codes vary in response time and accuracy, influencing BST significantly. The study collects ride-check data, utilizing regression models to analyze the QR code's influence on BST, considering payment choices, failures, and delays in using QR codes. It also examines boarding crowdedness to understand its impact on the boarding process. This empirical study from Wuhan aims to identify QR code's influence on BST, crucial for enhancing bus service efficiency. The paper outlines the evolution of smartphones and their role in facilitating mobile payments, particularly QR codes, for various transactions, including bus fares. It highlights the advantages and limitations of QR codes, focusing on their impact on BST and the broader implications for transit systems. The paper's contributions lie in being the first to study QR code efficiency in bus transit, quantifying its impact on BST compared to conventional methods, and using boarding crowdedness to analyze this impact. The structure includes a literature review, modeling of payment processes, numerical analysis in different boarding scenarios, and concludes with recommendations to enhance QR code payment efficiency. In this research paper [3], the main focus is on investigating the transportation payment system in DKI Jakarta, emphasizing the struggle to promote public transportation usage over personal vehicles. Despite the introduction of card-based payment systems, the desired shift hasn't occurred due to persistent payment challenges. The study suggests Near Field Communication (NFC) as a potential solution for facilitating ticket purchase, ensuring passenger identification, deducting fares based on distance, and providing real-time transport information. Employing a qualitative approach via literature review, interviews, and observations, the research highlights three key findings: NFC enhances convenience for public transport users, successful implementation in advanced countries, and simplification of payment transactions. The imbalance between personal and public transportation in DKI Jakarta, caused by sluggish and cumbersome payment systems, motivates the exploration of application-based solutions. The limitations of current card-based systems, such as difficulty in balance top-up and security concerns, prompt the consideration of NFC, leveraging smartphones for payment transactions. The objectives encompass understanding technological benefits in alleviating transportation challenges, exploring NFC's utilization in various countries, and assessing NFC's potential adoption in DKI Jakarta.

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III. PROPOSED SYSTEM

System Architecture: The system is a mobile application accessible via the play store/app store . It's built using Flutter for the front end to ensure a responsive and user-friendly interface and fire base for the backend operations. User Roles: The system supports two main user roles: Passenger: Passengers can create accounts, log in, and access their dashboards. They can book a ticket/pass by scanning the QR code provided in the bus. Admin: Conductor/ TC can register their charging stations on the website by providing station details, such as location, charging capacity, pricing, and verification information. They can al manage station information through their dashboard. Administrators: Administrators oversee the entire system. They have access to an admin dashboard, where they can monitor and manage user accounts, stations, payments, and resolve disputes. User Authentication and Authorization: Users can create accounts using their email addresses and set passwords. Account verification is done through email confirmation. After logging in, users are directed to their respective dashboards based on their roles. Payment Processing: Users make payments for slot bookings using a secure payment gateway integrated into your Django application. Payment details are securely processed and stored in the SQLite database.

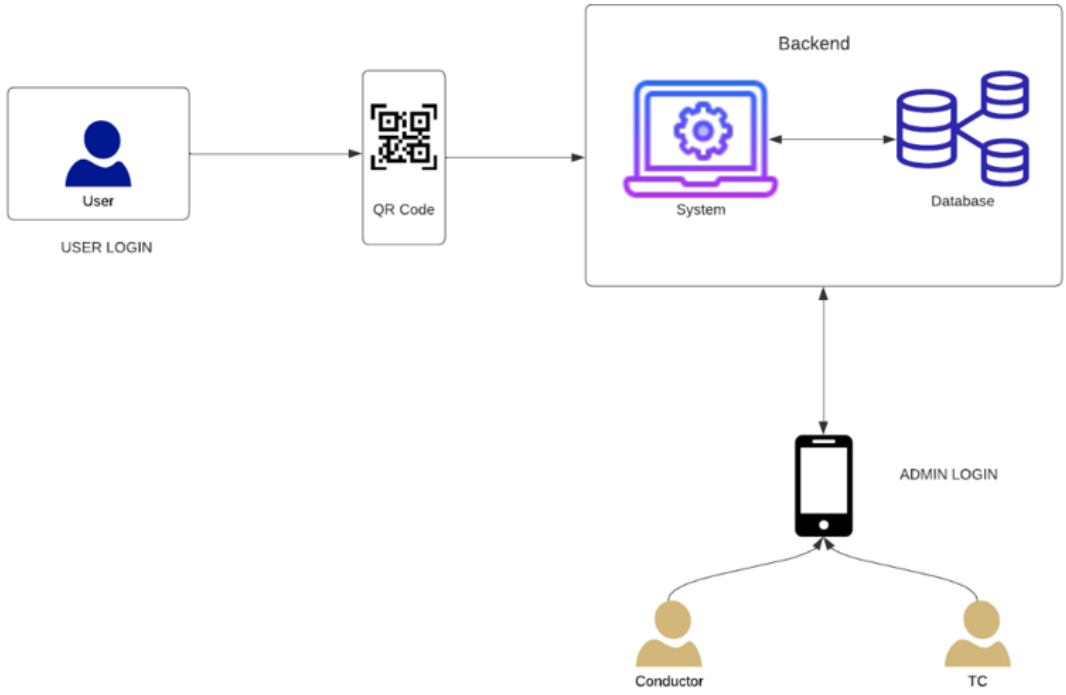

Figure 1: Proposed System for UPI Integration in Public Transport

IV. CONCLUSION

Our Proposed System will achieve several key objectives, enhancing the way passengers pay for bus tickets. The integration of the UPI payment system offers passengers a more convenient and efficient means of conducting transactions. This eliminates the need for physical cash and minimizes waiting times, significantly improving the overall experience. Furthermore, our project prioritizes security through the adoption of modern payment technology and encryption practices. This heightened security reduces the risk of fraud and ensures passengers' financial information remains safe throughout their journeys. In this manner, the project not only streamlines payment processes but also enhances the security of financial transactions. The application's success is underscored by its fitness for purpose. It provides passengers with a user-friendly interface, while authorities gain valuable tools to manage and monitor transactions. The project adheres to high standards of design and implementation, ensuring the system's modularity, scalability, and maintainability. The choice of UPI technology as the payment integration method has proven wise, considering its widespread use and robust security features. This choice has facilitated a smoother and more secure payment process for both passengers and authorities. The project's results manifest in several tangible benefits. Passengers enjoy a more convenient and secure payment method, while authorities benefit from improved transaction processing and ticket verification efficiency. The reduction of cash dependence contributes to a more cashless and digital payment

ecosystem. Additionally, the heightened security measures make fraudulent activities less likely and promote transparency in financial transactions, benefiting passengers and authorities alike. In essence, our solution revolutionizes payment and ticketing in public transport. It replaces outdated, error-prone ticketing systems with a modern, mobile-based payment solution. The integration of UPI technology elevates the security and convenience of public transport payments, significantly enhancing the sector. Furthermore, the project's contribution to the broader digital payment ecosystem in India is invaluable. By providing a unified and efficient system, it improves the overall public transport experience for passengers and authorities. Nevertheless, it is essential to acknowledge certain limitations. Connectivity and accessibility challenges in remote areas may restrict passengers who cannot use the mobile application. Additionally, the adoption rates among passengers and authorities may vary, necessitating ongoing efforts to ensure widespread acceptance. While the system boasts robust security, potential cybersecurity threats remain a concern, underlining the necessity for continuous monitoring and updates. In conclusion, the integration of the UPI payment system into public transport signifies a significant advancement in passenger convenience, security, and efficiency. The project successfully meets its objectives, offering an improved experience for all stakeholders. By adhering to robust design and implementation practices, it presents a sophisticated yet user-friendly solution. Despite inherent challenges, this project marks a substantial leap towards digitizing payment methods and elevating the quality of public transport services in India.

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