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INTEGRATED SINGLE TICKETING FOR PUBLIC TRANSPORT IN SURAT

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Deloitte.

INTEGRATED SINGLE TICKETING FOR PUBLIC TRANSPORT IN SURAT

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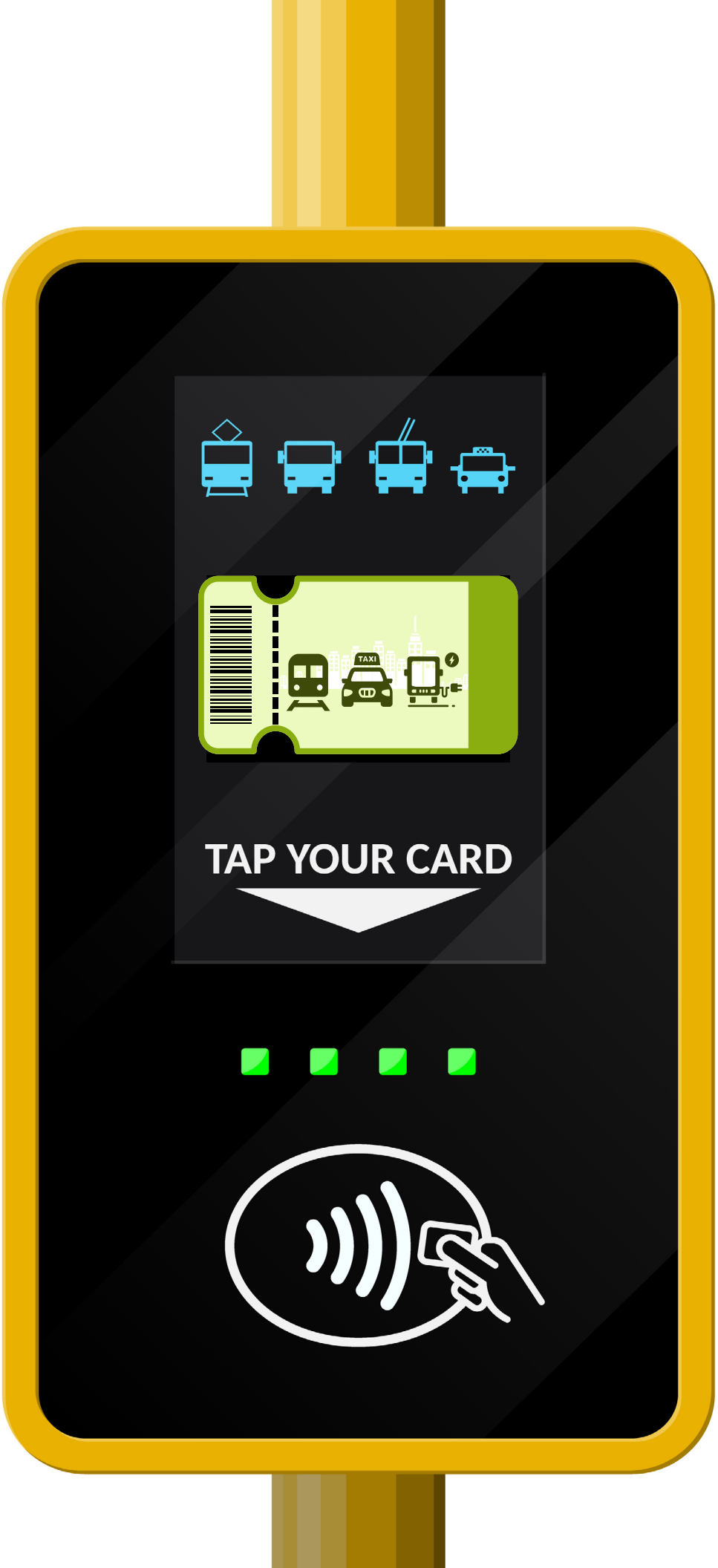
List of Abbreviations

AAVS	Automatic Add-Value Service
AFCS / AFC	Automated Fare Collection System
ATM	Automated Teller Machine
BRTS	Bus Rapid Transit System
DLR	Docklands Light Railway
ICCC	Integrated Command and Control Centre
ICICI	Industrial Credit and Investment Corporation of India
IC	Integrated Circuit
KCRC	Kowloon-Canton Railway Corporation
KMB	Kowloon Motor Bus
KYC	Know Your Customer
MTR	Mass Transit Railway
MTR / MTRC	Mass Transit Railway Corporation
NEC	Nippon Electric Company Limited
NEFT	National Electronic Funds Transfer
NFC	Near Field Communication
NFIS	National Financial Inclusion Strategy
NPCI	National Payments Corporation of India
NS	Nederlandse Spoorwegen, which translates to 'Dutch Railways'
NCMC	National Common Mobility Card
OTP	One Time Password
PNB	Punjab National Bank
PS	Point of Sale
RBI	Reserve Bank of India
SBI	State Bank of India
SSL	Surat Sitilink Limited
TL	Transport for London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TAP YOUR CARD

Executive Summary

Surat, one of India's fastest-growing urban centres, exemplifies the transformation underway in urban mobility with its dynamic economic activities and substantial industrial base. The city boasts multiple transit systems, including the largest segregated Bus Rapid Transit System (BRTS) network in India and a planned metro network, reflecting remarkable advancements in public transport infrastructure. Despite these developments, Surat faces persistent challenges in fare integration. Its current transit payment ecosystem remains fragmented, creating barriers to seamless travel and leading to inefficient passenger experiences. Integrated digital ticketing aims to resolve these challenges by offering a unified fare payment system across all modes of transport and related urban services, simplifying fare collection, enhancing operational efficiency, and improving user convenience. Fare payment media have evolved from traditional cash payments to advanced electronic systems, including closed-loop cards, open-loop cards, e-tickets, and contactless payments, each with its own set of advantages and limitations

India's National Common Mobility Card (NCMC) was launched in 2019, aims to enable seamless travel across different modes of public transport through a unified payment system. It supports both contact and contactless transactions and offers full banking functionality, promoting interoperability and financial inclusion. Introduced in 2018, the Surat Money Card offers seamless fare payments on Bus Rapid Transit System (BRTS) and city buses, extending to non-transit use cases like retail purchases and civic services. It provides discounted fare structures for students, women, senior citizens, and differently abled persons, enhancing accessibility and convenience.

The report identifies several challenges in integrating fare payment systems in Surat, including onboarding friction due to Know Your Customer (KYC) requirements, limited card acceptance across platforms, dependency on closed-loop systems and technological fragmentation. The case studies of Hong Kong and London provide valuable lessons in integrated single ticketing, emphasising the importance of collaboration between transport modes and payment systems to create an efficient and user-friendly solutions. A workshop in Surat highlighted the need for a unified single-ticketing system, policy and institutional support, digital infrastructure, accessibility, data-driven operations, and awareness strategies to promote integrated single ticketing.

The report identifies following key recommendations to successfully operationalise the integrated single ticketing system in Surat:

- Prioritise implementation of unified integrated single ticketing system
- Upgrade existing infrastructure in line with latest payment systems
- Streamline policy and regulatory frameworks to fasten adoption
- Leverage data to optimise payments and operations
- Enhance accessibility to accelerate integrated payments adoption
- Promote integrated payment system via public awareness campaigns
- Develop innovative business models around fare payments
- Leverage multi-stakeholder views to build a unified platform


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01

Setting the Context

1.1 Introduction

India's public transport landscape is undergoing a significant transformation, driven by rapid urbanisation and the need for sustainable mobility solutions. The introduction of metro systems along with the expansion of Bus Rapid Transit Systems (BRTS) and E-buses, reflects the country's commitment to enhance the urban mobility. The National Common Mobility Card (NCMC) initiative, launched in 2019, aims to unify fare payment systems across various modes of transport, promoting interoperability and financial inclusion. This growth in public transport infrastructure is crucial for addressing the challenges of traffic congestion, pollution, and inefficient travel experiences, making integrated single ticketing systems an essential component of India's urban mobility strategy.

Surat, one of India's fastest-growing cities, exemplifies this transformation with its dynamic economic activities and substantial industrial base. The city's public transport system has seen remarkable advancements, including the establishment of the largest segregated BRT network in India and the planned metro network. Despite these developments, Surat's fare collection systems remain fragmented, creating barriers to seamless travel. The introduction of the Surat Money Card in 2018 marked a significant step towards integrated single ticketing, offering seamless fare payments across BRTS and city buses. However, few challenges persist. Implementing a unified digital single ticketing system is crucial for enhancing the user convenience, operational efficiency, and promoting sustainable urban mobility in Surat.

02

Fare Payment Systems

2.1 Overview of fare payment media

Fare payment media have evolved significantly over the last two decades, transitioning from traditional cash payments to more advanced electronic systems. The primary type of fare payment media includes cash, tickets, e-tickets, closed-loop cards, and open-loop cards. These fare payment media along with their pros and cons have been highlighted in figure1.

Cash payments, while still prevalent, are increasingly being phased out due to their inefficiency and high operational costs. Tickets, both journey-based and stored value, offer a simple and cost-effective solution but are prone to fraud and do not provide immediate data for operational optimisation. E-tickets, which can be purchased online or via mobile apps, offer a fast and efficient method for fare payment, though they require pre-trip payments and may compromise inclusivity.

Closed-loop cards are restricted to specific merchants and must be preloaded with funds, offering a secure and convenient method for fare collection. Open-loop cards allow transactions between any issuing bank and merchant within the same payment scheme, providing greater interoperability and convenience.

Figure 1: Overview of fare payment media

2.2 Need for integrated single ticketing in Surat

As urban mobility evolves, cities are increasingly adopting multimodal transport systems that include buses, metros, trams, and shared transport services. This shift aims to provide comprehensive and efficient transportation options to meet the diverse needs of urban population. However, the fare collection systems often remain fragmented, leading to inefficiencies and inconveniences for both users and service providers. The lack of interoperability between different modes of transport means passengers must juggle multiple payment systems, which can be cumbersome and discourage the use of public transport for end-to-end journeys.

Integrated single ticketing addresses these challenges by unifying the fare collection process across all modes of urban transport. It simplifies the user experience by enabling a single card or app to be used for all travel needs, regardless of the mode or operator. This not only enhances convenience for passengers but also improves operational efficiency for transit agencies. Integrated single ticketing systems consolidate data, reduce collection costs, enable fare capping, and provide better insights into passenger movement, which can inform the planning and service improvements.

In the context of Surat, a city that is rapidly developing its public transport infrastructure, integrated single ticketing system is particularly crucial. Surat's urban mobility landscape includes the BRTS, city buses and the upcoming metro system. Despite these advancements, the fare collection systems remain fragmented, creating barriers for seamless travel. By implementing an integrated single ticketing system, Surat can offer a unified and inclusive public transport experience. This aligns with the city's smart city goals and national programs like the National Common Mobility Card (NCMC), which aims to create a unified, open-loop and interoperable platform for payments across various transport modes. Integrated single ticketing system in Surat would not only streamline the travel experience for residents but also support the city's broader objectives of enhancing public transport usage, reducing traffic congestion, and promoting sustainable urban mobility.

2.3 Analysis of emerging fare payment systems

As cities evolve into smarter, more connected urban ecosystems, the way passengers pay for travel is undergoing rapid transformation. Traditional cash and paper-based ticketing systems are increasingly being replaced by digital Automated Fare Collection Systems (AFCS). Among these, four major fare payment methods are gaining prominence in India and globally: Closed-loop cards, Open-loop cards, electronic tickets (e-tickets) and contactless payments. Each system offers unique advantages and challenges based on operational context, user demographics, infrastructure and policy objectives.

2.3.1 Closed-loop cards

Closed-loop cards are mode-specific prepaid cards that are issued and operated by a particular transit agency or consortium of agencies. These cards are typically more cost-effective than cash options and can operate in offline mode, without requiring an internet connection. The payment involves the cardholder purchasing the card from an issuing agency, which could be a transit agency or a third-party vendor. The cardholder then loads value onto the card using various methods such as cash or credit/ debit transactions. To pay for services, the cardholder taps the card on a reader or validator at entry/ exit points, where the fare is calculated and deducted from the card's balance. Revenue settlement is typically processed in near real-time, ensuring that operators receive funds promptly.

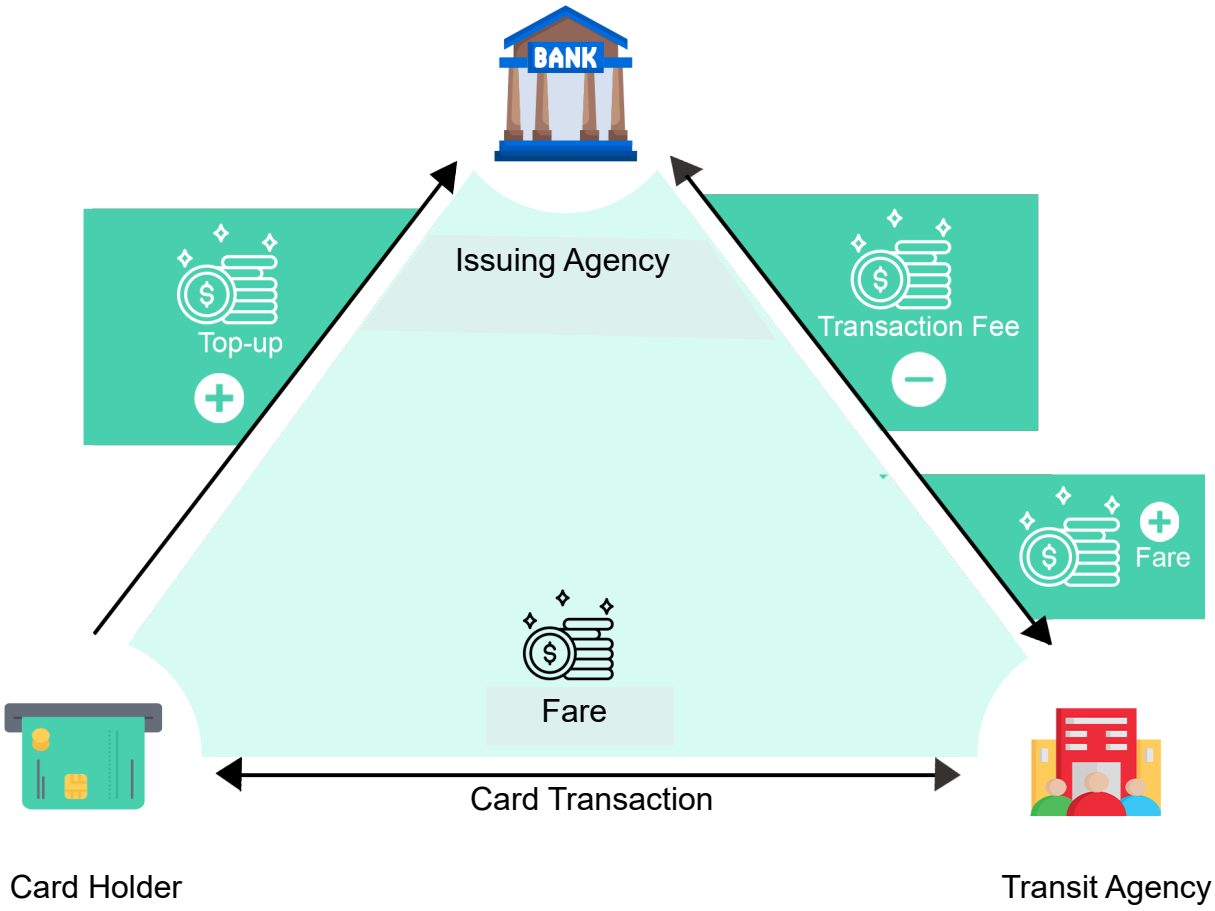


Figure 2: Closed-loop payment architecture

Closed-loop systems allow full control over fare policies, travel concessions and ticket validation infrastructure. The agencies can easily implement segment specific-discounts, track ridership and manage financial flows within the system. However, they lack portability, a closed-loop card issued in one city or system cannot be used elsewhere, limiting the user's flexibility.

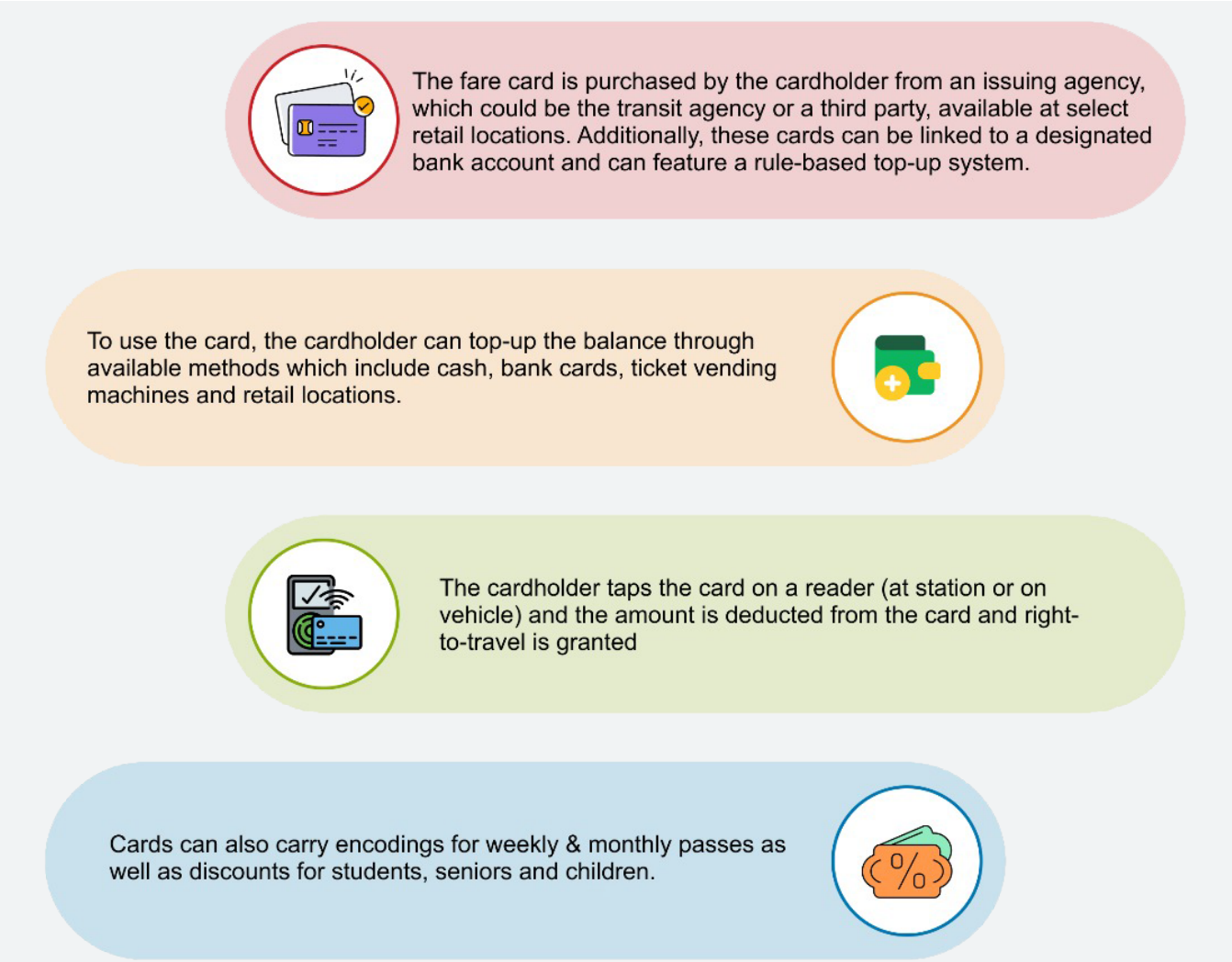


Figure 3: Closed-loop payment mechanism and global implementations

Some of the globally successful closed-loop systems include Hong Kong's Octopus Card, London's Oyster Card and the Clipper Card in the San Francisco Bay Area. These systems have demonstrated the effectiveness of closed-loop cards in creating a seamless and efficient public transport experience, making them a popular choice for cities looking to modernise their fare collection infrastructure.

Figure 4: Closed-loop system

2.3.2 Open-loop cards

Open-loop cards are electronic payment cards that enable transactions between customers of any issuing bank and merchants connected to any acquiring bank within the same payment scheme. These cards provide greater interoperability across services, not just transit systems and flexibility compared to closed-loop systems given they conform to global payment gateway system such as Mastercard, Visa and Rupay. The payment process involves the cardholder using a debit, credit or prepaid card issued by any bank to pay for services. The cardholder taps the card on a reader or validator at entry/exit points, where the fare is calculated and deducted from the linked bank account. This system requires online connectivity for transaction validation, ensuring that funds are available and the payment.

Open-loop systems offer several advantages, including lower fare collection costs, decreased passenger time spent on purchasing transit passes and higher passenger satisfaction due to convenience and scalability. They support a wide range of devices, including Near Field Communication (NFC) enabled phones, key fobs and smartwatches, providing greater flexibility and convenience for passengers. Additionally, open-loop cards facilitate seamless travel across different transport modes and operators, enhancing the overall user experience. However, they may pose challenges in terms of managing fare policies and travel concessions, as these need to be coordinated across multiple stakeholders, especially banks to manage card issuance, security and user verification via 'Know Your Customer (KYC)' process. Also, the open-loop systems require always-on connectivity for real-time processing and they can face issues such as card rejections or failed validations in low-network areas. Nevertheless, for digitally mature cities, open-loop presents the future of urban ticketing.

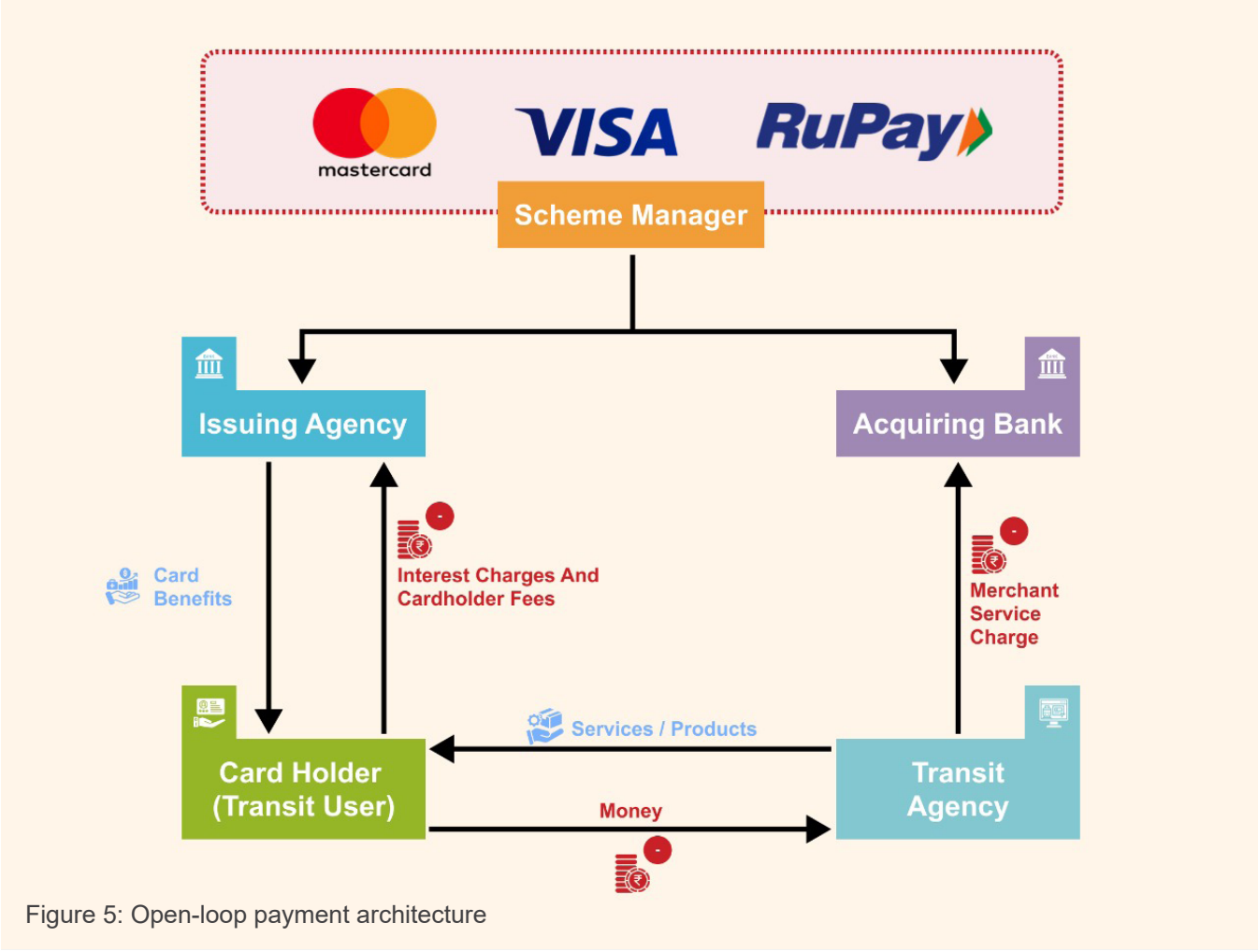


Figure 5: Open-loop payment architecture

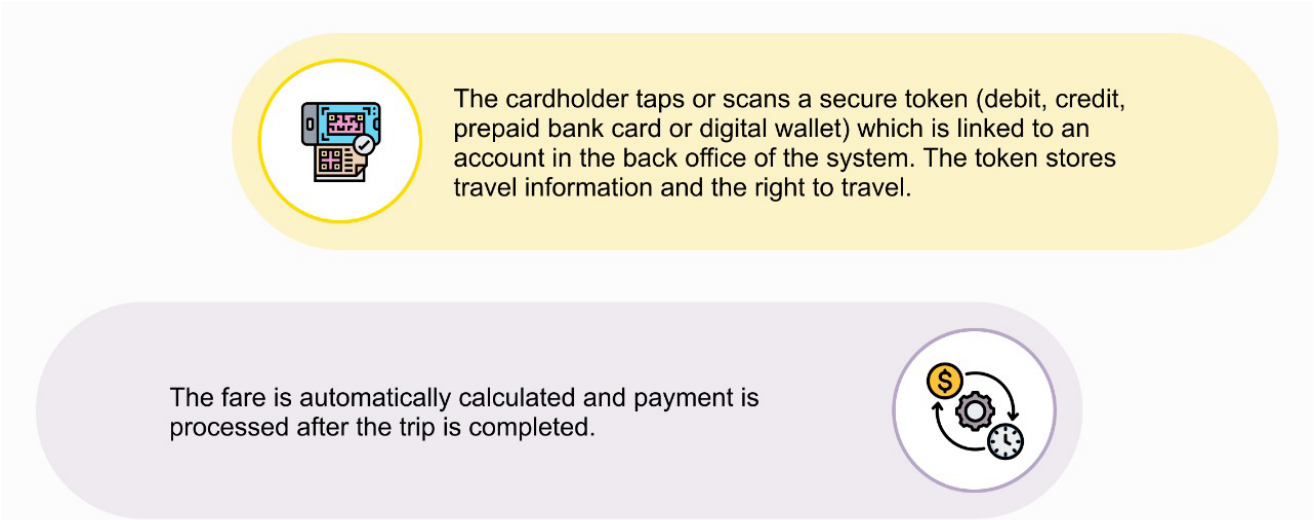


Figure 6: Open-loop payment mechanism

Examples of successful open-loop systems include London's contactless payment system, which encompasses both the Oyster Card and contactless debit and credit cards and New York City's OMNY system. These systems have revolutionised fare collection by providing a secure, convenient and interoperable method for passengers to pay for their journeys, making them an attractive option for cities looking to enhance their public transport infrastructure.

MTA New York City Transit

MTA New York City Transit has begun accepting open-loop payments, which will eventually replace the MetroCard upon full implementation. This system requires online connectivity for transaction validation.

Transport for London (TfL)

Transport for London (TfL) introduced open-loop payment systems to complement the Oyster Card and ceased accepting cash payments in 2014. Although card and transaction validation are time-lagged, which poses revenue risks from blocked or expired cards, this risk remains low at less than 0.5%.

Figure 7: Global case studies for open-loop systems

2.3.3 E-tickets

E-tickets are digital tickets that can be purchased and stored on mobile phones, email or printed on paper. These are typically accessed through websites, mobile apps or vending kiosks and are presented at fare gates in the form of a QR code, barcode or alphanumeric code. E-tickets are highly flexible, cost-effective and require minimal infrastructure compared to physical card-based systems.

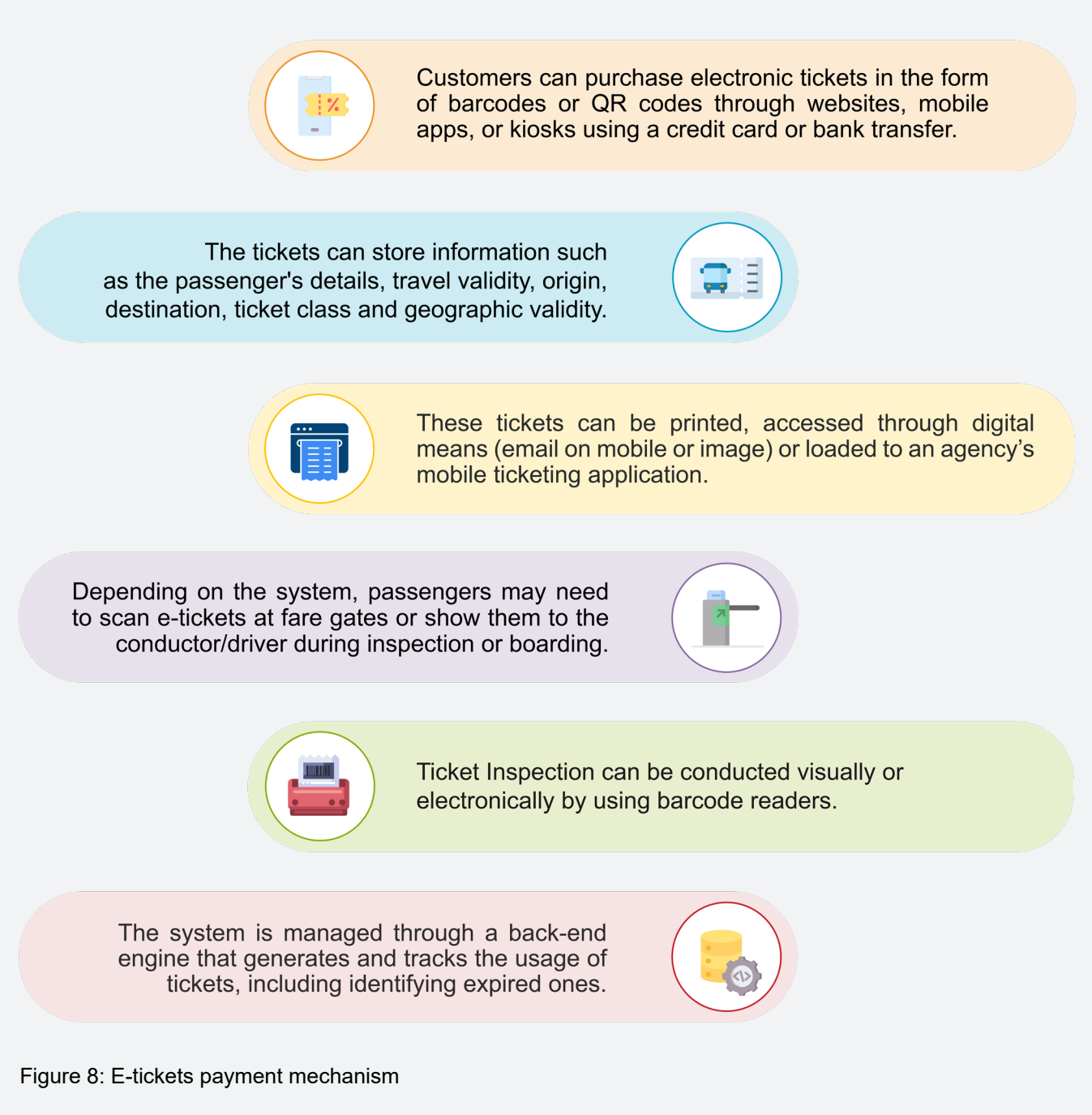
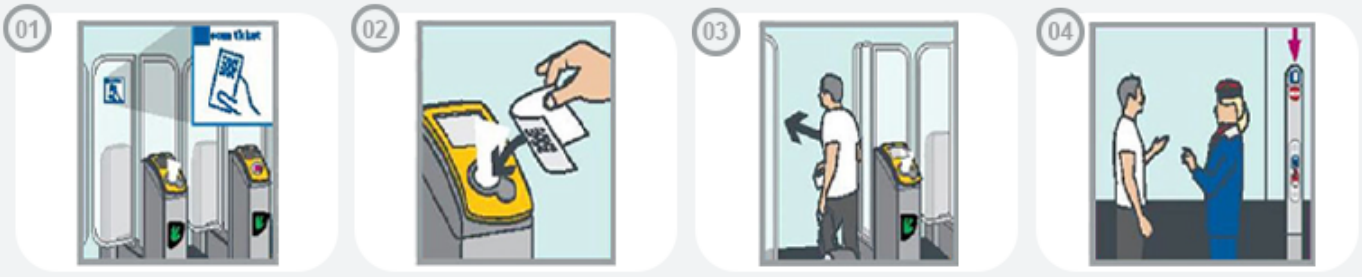


Figure 8: E-tickets payment mechanism

They are particularly well-suited for occasional travellers, tourists and tech-savvy commuters who prefer not to carry physical cards. E-ticketing enables complex fare rules such as peak-hour surcharges or route-based pricing to be implemented in real-time. Moreover, agencies can link ticketing platforms with Customer Relationship Management (CRM) systems for promotional campaigns, personalised pricing and loyalty programs.

Nederlandse Spoorwegen (NS) Netherlands

NS Netherlands accepts e-tickets in the form of QR codes to store passengers' travel rights. Passengers can either print the QR code or load it onto the NS Mobile App. The QR code is then scanned at check-in gates or by an inspector. Tickets can be conveniently purchased online or through the mobile app using bank cards. Revenue settlements in the Netherlands are managed through the Octopus clearing house.



Indian Railway

Indian Railways has updated its ticket reservation system to issue a unique QR code for each booked ticket. This QR code can be scanned by the ticket examiner to verify the ticket in a contactless manner.

Figure 9: Case studies for E-tickets

However, e-tickets are limited by smartphone penetration, battery life and the need for internet access. In lower-income groups or digitally excluded populations, e-ticketing cannot be the only solution. Additionally, in high-volume settings like metro gates, QR code scanning may be slower than contactless card taps.

Notable examples include NS Railways in the Netherlands, Indian Railways' QR system and Delhi Metro's mobile-based ticketing. These systems prove that with the right backend and user interface, e-tickets can be a powerful tool for digital mobility.

2.3.4 Contactless payments

Contactless payment systems use Near Field Communication or Radio-Frequency Identification (RFID) to facilitate ultra-fast fare transactions with just a tap. These payments can be made using smart cards (closed or open-loop), smartphones, smartwatches or wearable devices. Unlike traditional card swipes or QR scans, contactless fare payments are designed to be completed in under 300 milliseconds, making them ideal for high-density urban mobility.

Contactless technology provides a seamless user experience — no PIN, no One Time Password (OTP), no need to insert cards or handle paper. It also reduces physical contact, which became particularly relevant during the COVID-19 pandemic. For transit agencies, contactless systems improve throughput at fare gates, reduce maintenance (due to fewer moving parts) and enhance reliability.

Contactless systems can be used within both closed-loop environments and open-loop platforms. Globally, cities like London have seen a rapid shift to open-loop contactless fare media, with more than 50% of trips processed via tap-to-pay methods as per 2022-year data.

The main considerations for deploying contactless solutions include terminal readiness, transaction latency and user education. However, once deployed, these systems significantly improve operational efficiency and passenger satisfaction.

Source 1: RailAdvent

2.4 Features of an efficient fare payment system

An efficient fare payment system is crucial for the optimal operation of public transportation networks. Such a system not only ensures seamless revenue collection but also enhances user experience, promotes accessibility and supports the financial sustainability of transit services.

Interoperability is a key feature, allowing seamless payment across all relevant transport modes such as metro, city buses and BRTS via a unified fare medium. This integration must support real-time transaction recognition across systems and facilitate smoother transfers without repeated fare deductions, ensuring a cohesive travel experience for passengers.

Inclusivity is another essential feature, ensuring that all demographic groups, especially the elderly, students, differently abled individuals and economically disadvantaged populations, can access and use the system. This includes physical access through reader placement and card top-up centres, as well as digital access via mobile applications compatible with low-end smartphones and feature phones. Affordability is also critical, with tiered pricing or subsidised fare options to accommodate various economic backgrounds.

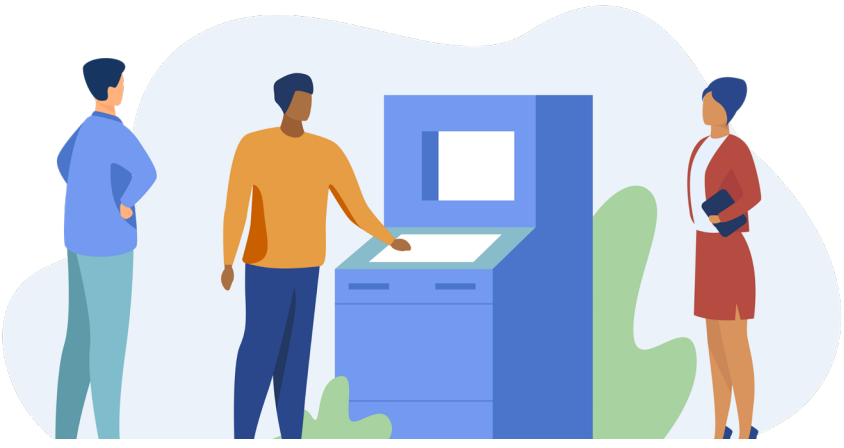
Convenience is paramount in an efficient fare payment system. The passenger experience must be simple and intuitive, reducing friction across the travel journey rom onboarding to fare payment and validation. Features such as contactless, tap-and-go functionality, minimised queueing and interaction with transport staff, as well as auto-top-up and fare history tracking through web or mobile platforms, contribute to a hassle-free travel experience.

Alignment with objectives and policies ensures that the fare payment system is flexible enough to integrate with broader government goals and evolving mobility frameworks. This includes integration with NCMC frameworks, accommodating policy levers such as tax rebates for regular users or digital incentive schemes and supporting transport equity goals under the National Financial Inclusion Strategy (NFIS).

Cost-efficiency is vital for the sustainability of the fare payment system, encompassing both upfront and recurring expenses. Leveraging existing infrastructure where possible, reducing operational costs through automation and promoting lifecycle cost planning for hardware, software upgrades and maintenance are essential components.

Implementation and rollout efficiency require a realistic, scalable and time-bound deployment process, accounting for infrastructure maturity and complexity. This includes modular deployment in pilot zones, clearly defined roles of vendors, system integrators and operators and capacity building and user adoption support.

Finally, risk management is crucial to safeguard user data, prevent revenue leakage and limit anti-competitive practices. This includes encrypted card/account data handling, monitoring for fraudulent top-ups or duplicate card usage and transparent procurement and audit processes to prevent monopolisation. Together, these features create a robust, user-friendly and sustainable fare payment system that enhances the overall efficiency and reliability of public transportation networks.



03

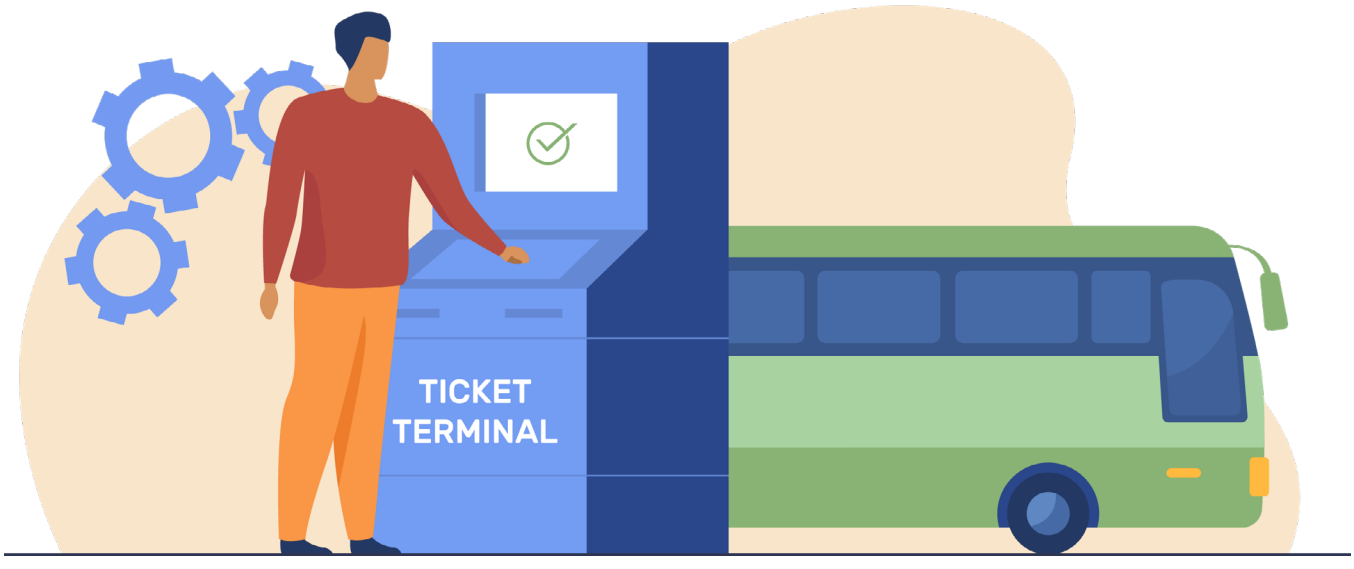
Overview of Global Fare Payment Systems

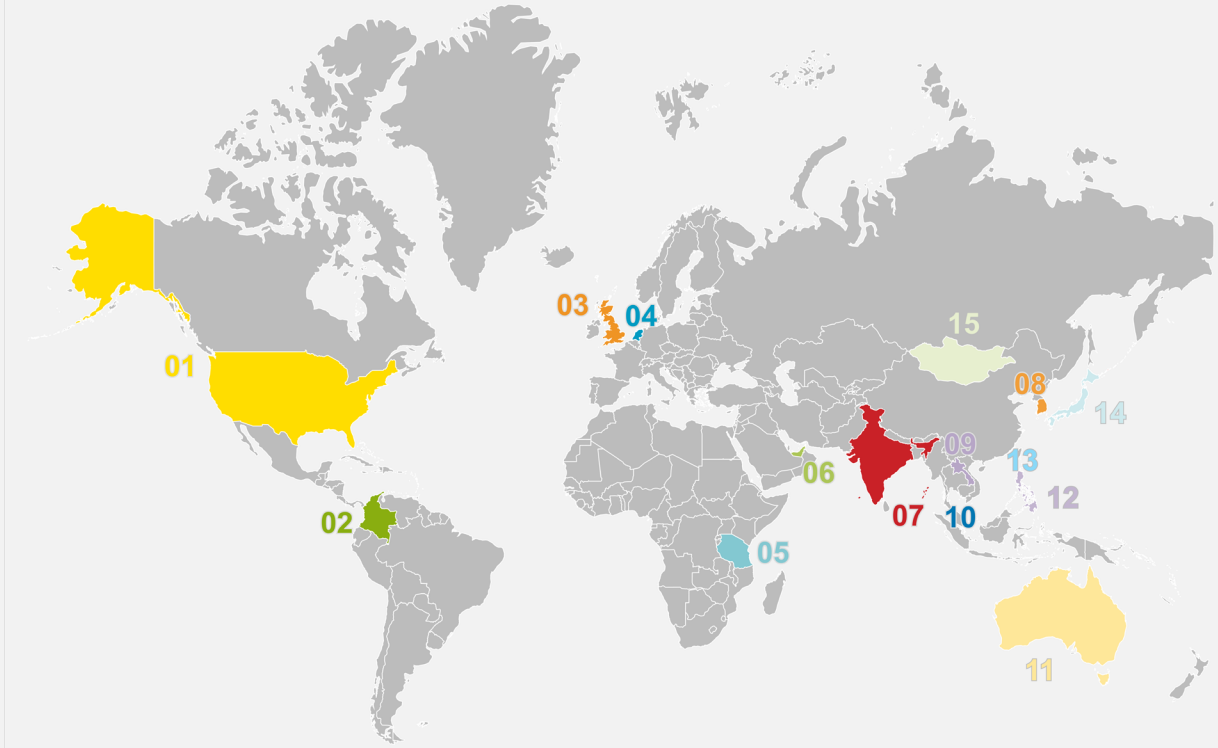
3.1 Overview of global experience

The global deployment of fare payment systems showcases a diverse range of approaches to modernising public transport infrastructure. Cities like London and the Netherlands have successfully implemented closed-loop systems, such as the Oyster card and Openbaar Vervoer (OV) Chipkaart, respectively, across all modes of transport, significantly reducing the reliance on cash payments. Hong Kong's Octopus Card and Singapore's EZ-Link Card are prime examples of closed-loop systems that have achieved high market penetration and efficiency. These systems allow for full control over fare policies, travel concessions and ticket validation infrastructure, enabling agencies to implement segment-specific discounts, track ridership and manage financial flows within the system.

Meanwhile, cities like California are pioneering open-loop payment systems, facilitating seamless transactions across buses, rail and metros. Open-loop systems provide greater interoperability and flexibility, allowing transactions between customers of any issuing bank and merchants connected to any acquiring bank within the same payment scheme. This approach supports a wide range of devices, including NFC-enabled phones, key fobs and smartwatches, providing greater convenience for passengers.

The map highlights the widespread adoption of both closed-loop and open-loop systems, reflecting the global trend towards more integrated, efficient and user-friendly fare payment solutions. By leveraging these advanced systems, cities can enhance operational efficiency, improve passenger convenience and support the financial sustainability of their public transport networks. This global perspective underscores the importance of adopting modern fare payment systems to create seamless and efficient urban mobility experiences.





California, USA:
Trials for open-loop payment systems across different modes including buses, rail, and metros. Plans to phase out cash and paper tickets through the deployment phase.

Bogotá, Colombia:
Dual-purpose bank-issued debit & transit card.

London, UK:
Deployment of closed-loop (Oyster card) and open-loop cards across all modes and operators in London. Restricted the use of cash in 2014.

The Netherlands:
Deployment of closed-loop (OV-Chipkaart) across all modes and operators in the country. Restricted the use of cash in 2014.

Dar Es Salaam, Tanzania:
Closed-loop.

Dubai, UAE:
NOL Cards (closed loop); plans afoot to move to account-based open loop.

Korea, Seoul:
T-money (open loop; account-based)

India:
National Common Mobility Card (NCMC) offers hybrid and open-loop options.

Laos:
Closed-loop.

Singapore:
EZ Link (Closed Loop); open-loop implemented too. Attempts to transition to open-loop only failed. Currently both systems are maintained.

Queensland, Australia:
Closed-loop.

Manila, Philippines:
Closed-loop.

Hong Kong:
Octopus (closed loop); world's oldest contactless transport payment card and one with the highest market penetration.

Japan:
Suica Cards (Tokyo Metro) – Closed loop.

Mongolia:
Closed-loop.

Figure10: Global case studies on integrated single ticketing

* Disclaimer: This geographical map is for informational purposes only and does not constitute recognition of international boundaries or regions; GIZ makes no claims concerning the validity, accuracy or completeness of the maps nor assumes any liability resulting from the use of the information therein.

04

Global Payment System: Hong Kong's Octopus Card

4.1 Hong Kong - city profile

Hong Kong, a special administrative region of the People's Republic of China, is one of the most densely populated territories in the world, with a population of approximately 7.4 million people as of 2022. Covering a total land area of 1,114.57 square kilometres, it is renowned for its vibrant urban landscape and significant economic influence. Hong Kong boasts a highly developed and sophisticated public transport network, which includes buses, ferries, trams and the Mass Transit Railway (MTR).

This extensive network supports the daily commute of millions of residents, contributing to Hong Kong's status as a major global financial centre and a gateway to Mainland China. The city's strategic location, coupled with its advanced infrastructure, makes it a pivotal hub for international trade and finance.

Figure 12: Hong Kong

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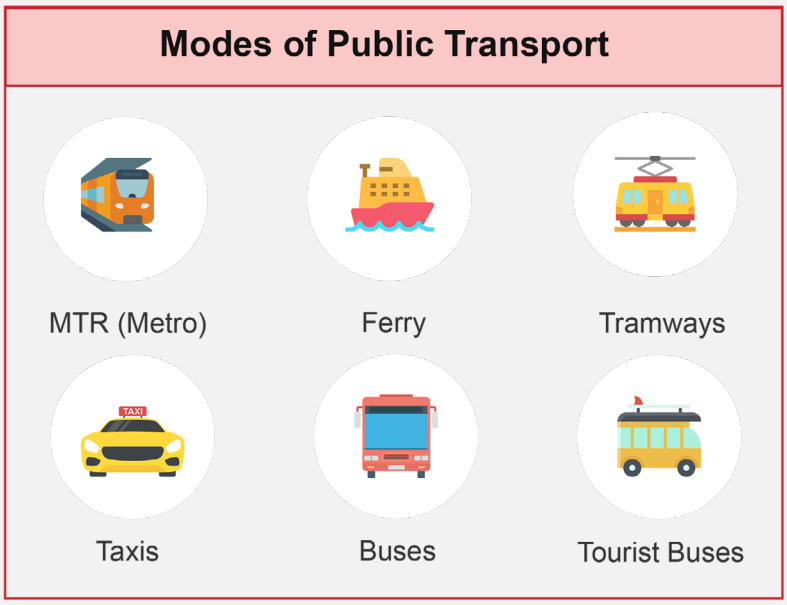
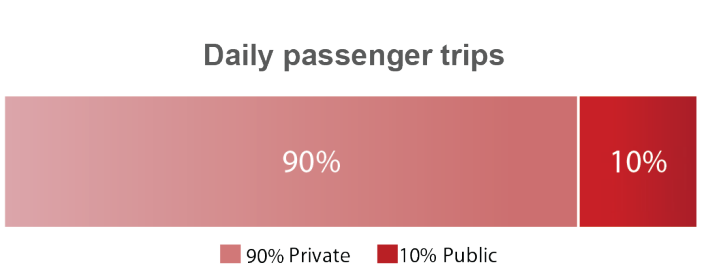


Figure 11: Public transport in Hong Kong

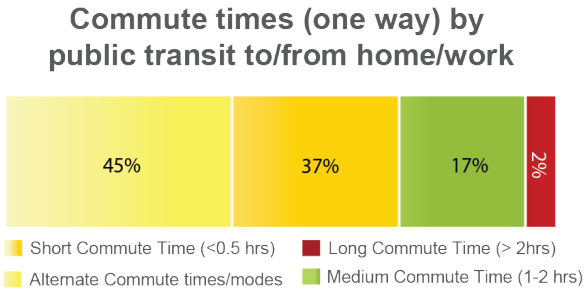
4.2 Hong Kong's public transport

Hong Kong has one of the most developed and sophisticated public transport networks in the world, catering to approximately 90% of daily passenger trips. The city's public transport system is highly efficient and diverse, encompassing various modes such as the MTR, buses, ferries, trams and minibuses. The MTR is the backbone of Hong Kong's public transport, providing rapid and reliable service across the city and its outlying areas. Buses, including franchised and public light buses, complement the MTR by offering extensive coverage and connectivity to areas not directly served by the metro. Ferries play a crucial role in connecting Hong Kong Island with the Kowloon Peninsula and the outlying islands, while trams provide a scenic and historic mode of transport along the northern coast of Hong Kong Island.

The city's public transport system is known for its high frequency, punctuality, and affordability, making it a preferred choice for daily commuters. On average, people in Hong Kong commute for about 44 minutes one way by public transit. The integration of various transport modes ensures seamless transfers and efficient travel, contributing to Hong Kong's reputation as a global leader in public transportation.



Hong Kong's Public Transport comprises ~90% of daily passenger trips, the highest in the world (2014)



People usually commute (one way) 44 min. by public transit (to/from home/work) in Hong Kong

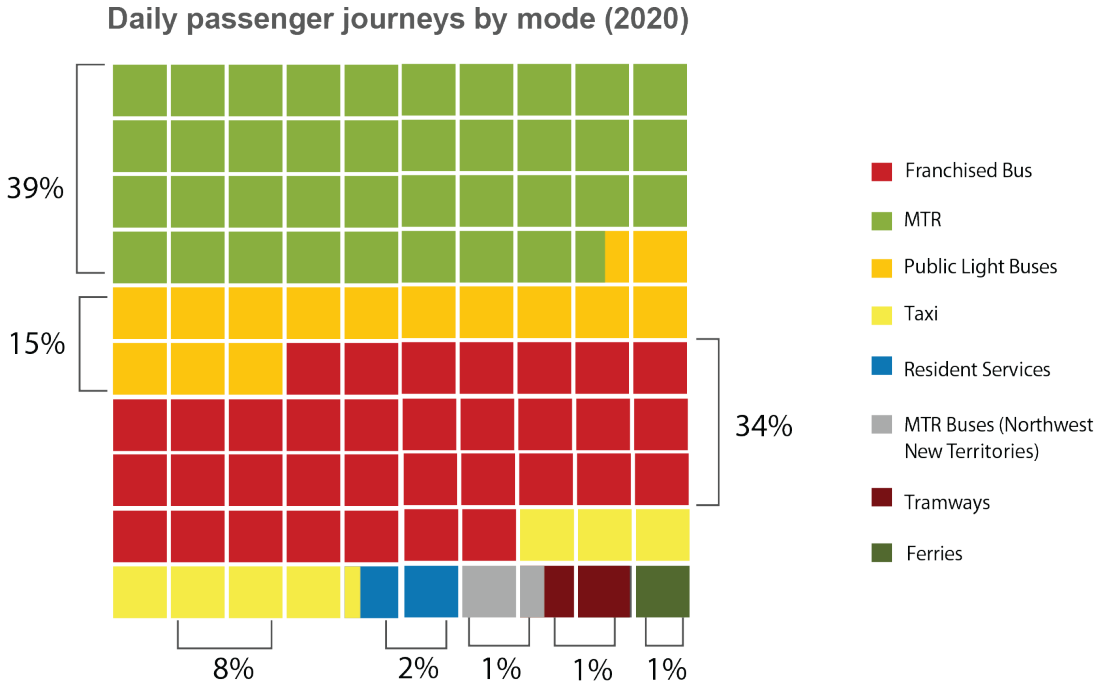


Figure13: Statistics on Hong Kong's public transport

Sources: Statista, HK Gov, Moovit, Civitatis, HK Gov

4.3 Emergence of octopus cards

4.3.1 Octopus cards' journey

The Octopus Card was introduced in Hong Kong as a simple way to pay fares on public transport. Its journey began in 1994 with the formation of Creative Star Limited, which later became Octopus Cards Limited in 1997. Initially designed for public transport payments, the Octopus Card quickly expanded to include micropayments for retail transactions. By 2003, 232 retail operators were accepting the Octopus Card, reflecting its growing popularity.

The adoption rate soared and by 2007, over 95% of people aged between 16 and 65 were using the card, with 8.4 million daily transactions valued at US$7 million per day. The card's success continued and by 2012, there were 14 million cards in circulation, facilitating over 10 million transactions daily. Today, the Octopus Card has a global reputation as a leading cashless payment solution, with more than 20 million cards in circulation and over 15 million daily transactions projected for 2024.

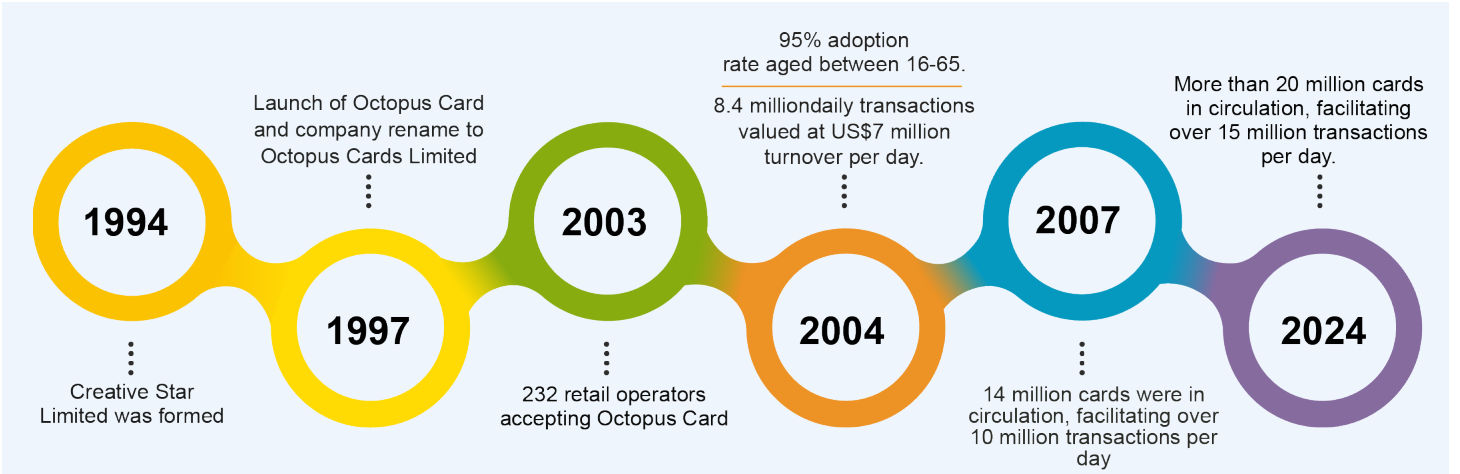


Figure14: Octopus cards' journey

4.3.2 Octopus Cards Limited

Octopus Cards Limited is a joint venture among several public transport agencies including the MTR Corporation, Kowloon-Canton Railway Corporation, Citybus and Kowloon Motor Bus (KMB). The ownership structure ensured alignment with public service goals and fostered interoperability across transport operators. This collaborative model also enabled a uniform clearing system for transaction settlements.

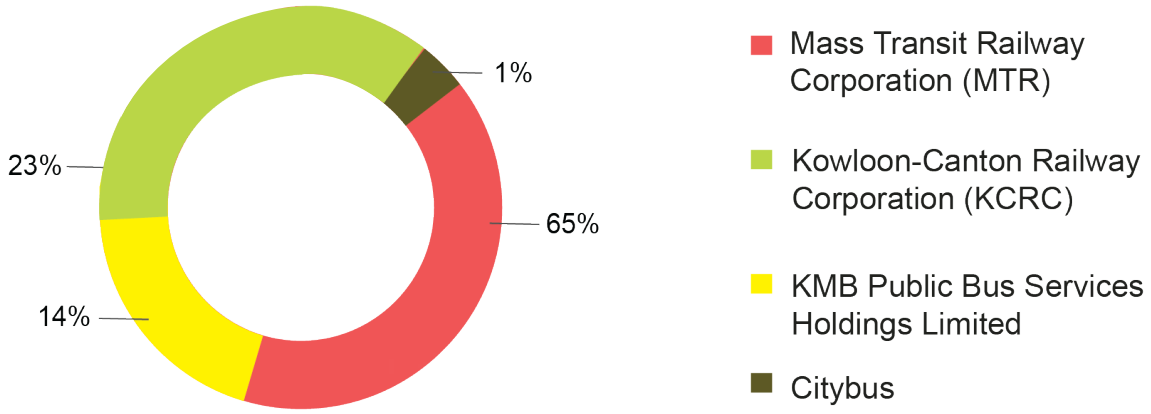


Figure 15: Latest shareholding of Octopus Cards Limited

4.4 Octopus cards

4.4.1 Types of octopus cards

Octopus cards are available in various forms to serve different demographics: Child Octopus Card, Adult Card, Elder Card, and Personalised Octopus Card (with ID and user-specific privileges). These categories enable tailored discounts for eligible users such as students, seniors and persons with disabilities.

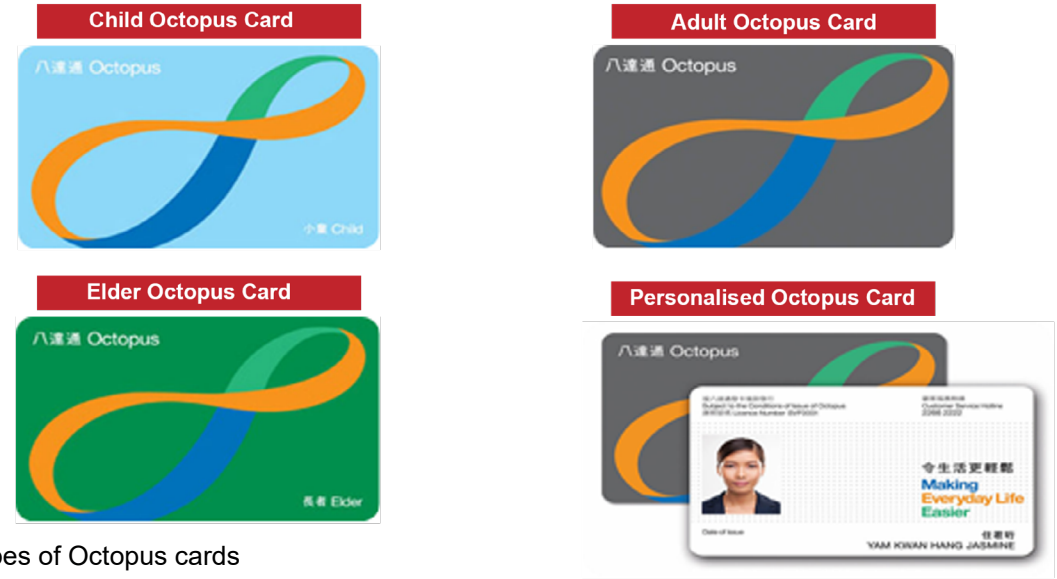


Figure 16: Types of Octopus cards

4.4.2 Modes supported

Octopus supports a wide range of transit modes, rail, tram, buses, ferries and extends to retail stores, vending machines, parking meters, schools and even residential buildings for access control. This versatility made Octopus not just a fare medium but an everyday payment tool.

4.4.3 Payment mechanism

The Octopus Card operates within a closed-loop system, utilising an IC chip to enable secure fare deductions via RFID readers. The infrastructure at the point of use includes a processing board and antenna system, which facilitates communication between the card and the reader. Transactions are processed offline and settled within 24 hours or by the next business day. Fare calculation is generally fixed-rate, requiring only a tap-in at most locations, which helps reduce congestion at entry and exit points. The Octopus Clearing House System manages payment settlements with merchants and service providers, ensuring efficient and timely processing of transactions. This robust payment mechanism has made the Octopus Card a reliable and convenient option for commuters in Hong Kong.

4.4.4 Features

The Octopus Card offers several unique features that enhance its functionality and convenience for users. One of the standout features is the Automatic Add-Value Service (AAVS), which allows the card to be automatically replenished with HK$250 (~28 Euros) from a connected bank account or credit card when funds are low. This ensures that users always have sufficient balance for their transactions without the need for manual top-ups. Additionally, Octopus Cards can be used for non-payment transactions, such as attendance cards for schools and access control cards for clubs, apartments, and residential buildings. This versatility extends the card's utility beyond just fare payments. Furthermore, corporate users can integrate their ID cards with Octopus functionality, a feature already implemented for all Kowloon–Canton Railway Corporation (KCRC) and Mass Transit Railway Corporation (MTRC) staff. This integration streamlines access and payment processes, making the Octopus Card a comprehensive solution for both personal and corporate use.

4.5 Impact of octopus cards

4.5.1 Benefits to transport agencies

The implementation of the Octopus Card system has brought significant benefits to transport agencies in Hong Kong. One of the primary advantages is the reduction in maintenance costs, which have decreased by 70% due to the lower upkeep requirements of contactless card readers and ticket barriers compared to traditional systems. Additionally, the system has led to a substantial reduction in fare evasion, with the Light Rail experiencing a decrease from 0.25% to 0.1%. The high reliability of the system is another key benefit, with the Mass Transit Railway (MTR) achieving a reliability rate of 99.9%, Light Rail at 99.7% and buses at 99%. Furthermore, the widespread adoption of the Octopus Card, with over 24 million cards in circulation, provides transport agencies with significant revenue opportunities from un-deducted deposits and the float generated by the average balance on each card.

4.5.2 Benefits to passengers

For passengers, the Octopus Card system offers numerous advantages that enhance their travel experience. One of the most notable benefits is the reduction in queue times, as the throughput through ticket barriers has doubled, increasing the number of passengers processed per minute from 28 to 40. This results in shorter waiting times and a more efficient travel experience. Additionally, passengers can take advantage of unique travel discounts offered by the Octopus Card, such as discounts for frequent travel and combined journeys on different feeder buses. Special groups, including the elderly, children and people with disabilities, also benefit from subsidised fares, making public transport more affordable and accessible for all. These features collectively contribute to a more convenient, cost-effective and user-friendly public transport system for passengers in Hong Kong.

4.5.3 Cards in circulation

The number of cards in circulation rose steadily, peaking at 36 million in 2018 before stabilising around 20 million by 2024. The system supports 15 million transactions daily, with over 180,000 acceptance points and a 98% penetration rate, solidifying Octopus as an integral part of Hong Kong's urban life.

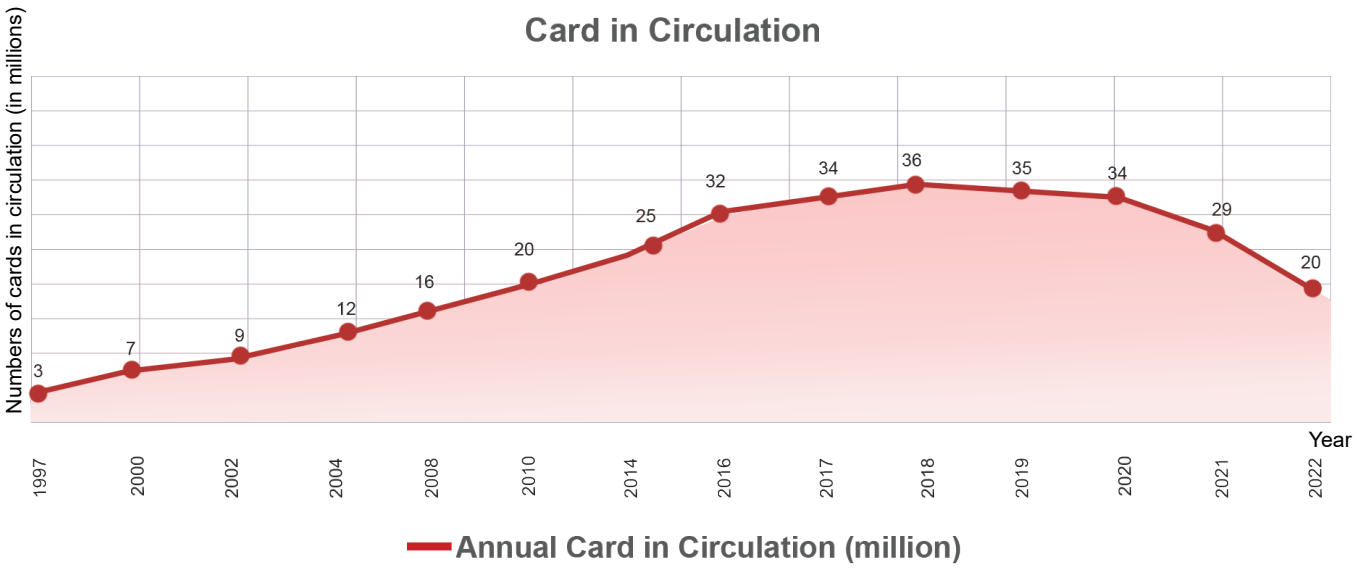


Figure 17: Octopus cards in circulation

Sources: Octopus Cards' Annual Reports: 2016, 2017, 2018, 2019, 2020, 2021, and 2022


METRO

05

Global Payment System: London's Oyster Card and Contactless Payment

5.1 London city

London, the capital city of the United Kingdom, is a global hub for commerce and finance, serving as the financial centre of the country. With a population of approximately 8.8 million people as of 2021, London is one of Europe's most populated cities, characterised by its dense urban sprawl.

The city covers a total land area of 1,572.03 square kilometres and has a significant number of private cars, totalling 2.6 million in 2020. Despite the high number of private vehicles, London has a sustainable transport network that includes iconic underground rail, buses, trams and bikes.

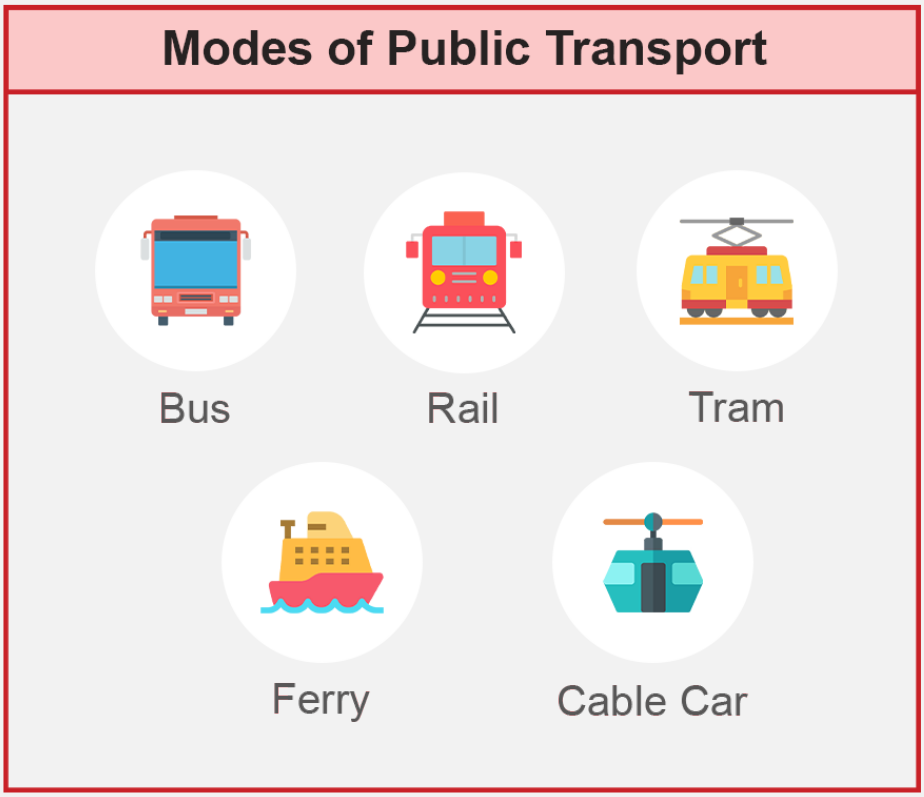


Figure 18: Public transport in London

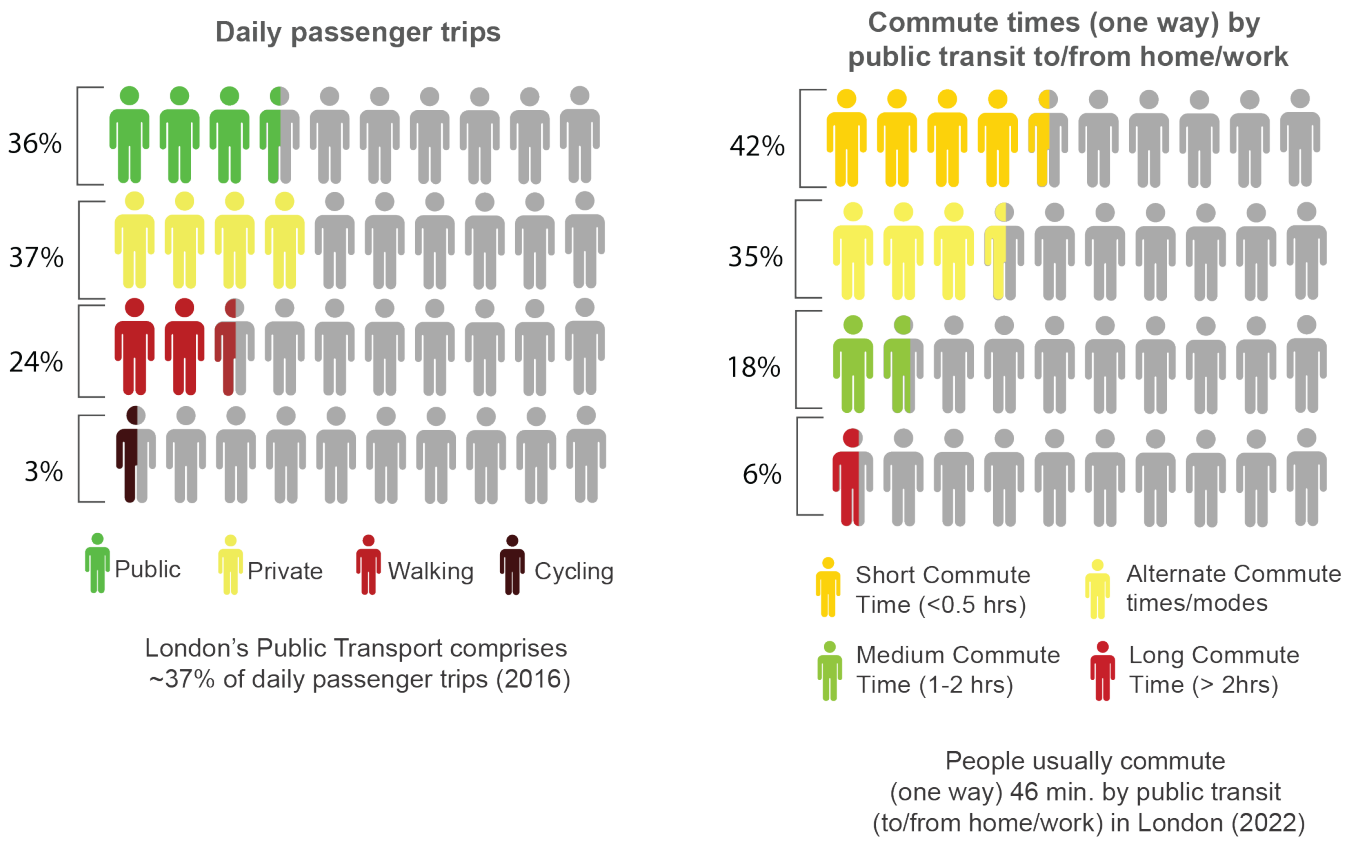
5.2 london's public transport

London's public transport system is extensive and diverse, comprising various modes such as buses, the London Underground, the London Overground, the Elizabeth Line, the Docklands Light Railway (DLR), trams, ferries and cable cars. Public transport accounts for approximately 37% of daily passenger trips in London (2016). The city's transport network is known for its high frequency, reliability and coverage, making it a preferred choice for daily commuters. The integration of different transport modes ensures seamless transfers and efficient travel, contributing to London's reputation as a leader in public transportation. On average, people in London commute for about 46 minutes one way by public transit.

As one of the world's leading megacities and a global benchmark for integrated urban transport systems, London houses a vast and intricate public transport network operated under the Transport for London (TfL) umbrella. This network includes buses, rail, underground metro, ferries, trams and cable cars. In 2022, public transport journeys in London totalled 3.3 billion across multiple modes. Approximately 54.8% of passenger journeys in 2020 were made using the Underground, followed by 32.7% on London buses, with the rest distributed among Overground, trams and ferries. TfL ensures multimodal integration, both in infrastructure and fare media, offering seamless travel across zones. The city's geography, population density and high tourist influx demanded early adoption of efficient, tech-driven fare collection systems, leading to the introduction of the Oyster card and later, contactless payment systems.

Disclaimer: This geographical map is for informational purposes only and does not constitute recognition of international boundaries or regions; GIZ makes no claims concerning the validity, accuracy or completeness of the maps nor

Figure 19: London geographical map



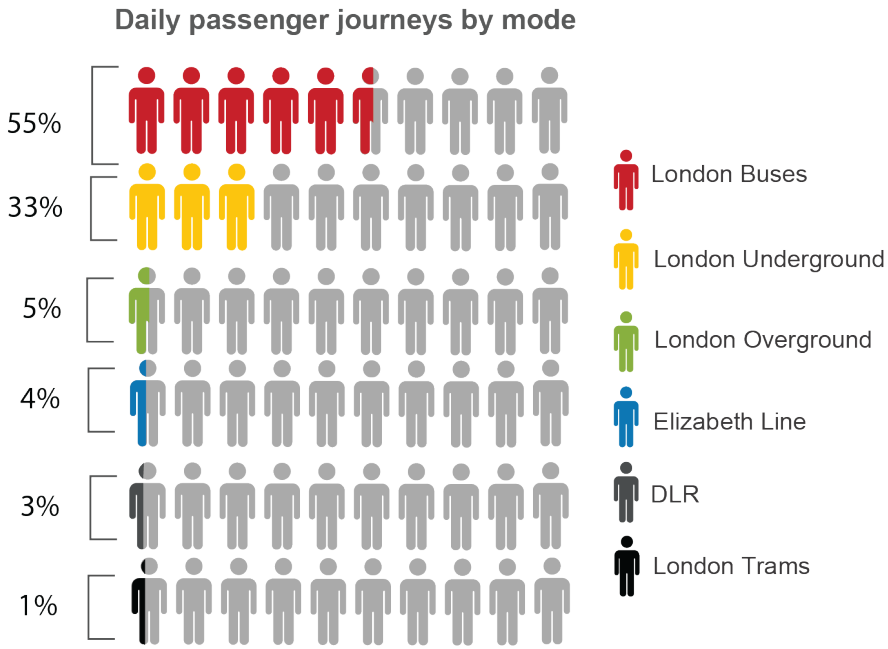


Figure 20: Statistics on London's public transport

Sources: Office for National Statistics, Statista, Moovit, Statista, TfL

5.3 Emergence of TFL payments system

5.3.1 TfL payment journey

The Oyster Card was launched in 2003 as a replacement for traditional paper tickets, marking the beginning of TfL's journey towards modernising fare collection. In 2007, TfL began testing NFC technology for mobile Oyster card integration and piloted contactless debit and credit cards with Barclays Bank, branded as Barclaycard. By 2012, TfL extended contactless services to include the Heathrow Express, Luton Airport, Welwyn Garden City and Reading. The official launch of contactless payments occurred in 2014, featuring daily and weekly fare capping. In 2016, contactless services were further extended to Gatwick Airport. By 2022, more than 50% of payments were made via contactless methods, highlighting the system's widespread adoption and success.

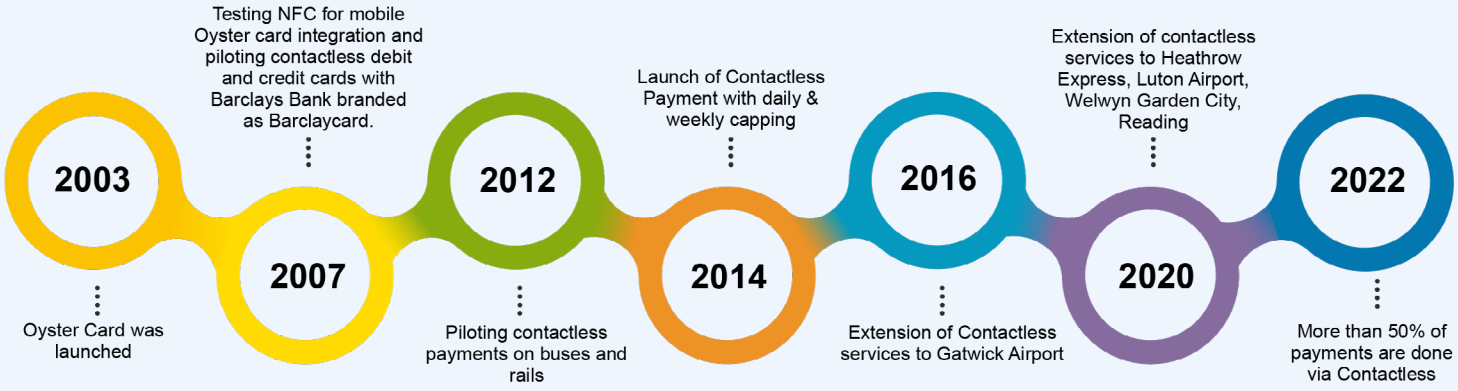


Figure 21: TfL's payments journey

5.3.2 TfL payment options

TfL offers one of the most mature and flexible fare payment systems globally, combining both closed-loop and open-loop options to serve a wide commuter base. Initially, the Oyster Card, launched in 2003, transformed the ticketing landscape by replacing paper-based tickets with a reloadable, contactless smart card. It allowed passengers to pre-load credit or travel cards and use it across nearly all TfL services.

Recognising evolving commuter behaviour and the growing dominance of digital banking, TfL expanded its infrastructure in 2014 to include open-loop contactless payments. This move enabled travellers to use bank-issued contactless cards or devices such as smartphones and smartwatches to tap in and out, without needing a separate Oyster card. Over time, the convenience and flexibility of these payments have led to high adoption rates, especially among tourists and occasional riders.

Figure 22: Oyster cards

- Open-loop options include credit and debit cards (Visa, Mastercard, American Express) and digital wallets (Apple Pay, Google Pay, Samsung Pay). These options require no sign-up and operate seamlessly alongside Oyster cards.

- Closed-loop options like the Oyster card continue to offer value for daily commuters, especially those eligible for discounted fares.

- Daily and weekly fare capping is automatically calculated for both payment methods, ensuring the best fare for commuters without requiring them to purchase travelcards in advance.

- All payment options are interoperable across buses, Underground, Overground, trams, ferries and cable cars, offering a unified and user-friendly experience.

5.4 TfL's payment system

TfL's fare system is designed to prioritise seamless inter-modality, high-speed validations and flexibility of payment mediums. It stands out not just in terms of technology but also the depth of its integration across modes and user demographics. TfL today offers both closed-loop (Oyster) and open-loop (with contactless) payment systems:

- **Oyster card:** A pre-loaded transit card that works within TfL's ecosystem. It supports pay-as-you-go travel, travel cards and passes.

- **Contactless cards:** NFC-enabled bank cards (Visa, Mastercard, etc.) and devices (smartphones, watches) allow tap-in/tap-out access across all TfL modes.

- **Mobile and wearable integration:** Devices like Apple Pay, Google Pay and smartwatches also serve as fare media, enabling quick access without physical cards.

  These options give users choice, flexibility and eliminate the friction of buying paper tickets or standing in top-up queues.

5.4.1 Modes supported

London's fare payment infrastructure is accessible across nearly every public transport option within the city. TfL has ensured that passengers can use the same payment medium to travel effortlessly across the following:

i. **London underground and overground:** Both heavy rail and metro-style operations accept all fare media with synchronised validation systems.

ii. **Buses and tramlink:** Whether traveling on traditional red buses or the tram system in

South London, passengers enjoy the same tap-in/tap-out flow.

iii. **DLR and Elizabeth line:** These rapid transit and cross-city rail lines are fully integrated into the TfL payment system, including contactless and Oyster validations.

iv. **River services and Emirates air line cable car:** Even less conventional transport modes are brought into the fare ecosystem, ensuring no mode is left isolated in terms of ticketing.

The same card (Oyster or bank-issued contactless) can be used across all these services without the need for separate tickets, platforms or apps. Whether using Oyster or a bank card, users can access all these services under a unified fare structure.

5.4.2 Features

What makes the TfL fare system globally relevant is not just its technology, but how well it serves passengers across all demographics and frequency types.

- Fare capping is one of the most user-centric features, automatically calculating the lowest cost for multiple journeys. Riders are never overcharged, even if they forget to buy a travelcard upfront.

- No registration needed for contactless cards makes it especially convenient for tourists and infrequent users.

- Prepaid top-ups and stored value remain available via Oyster, with balance checks and top-ups offered at thousands of kiosks and online platforms.

- Account-based ticketing through contactless methods allows post-paid fare deduction—enhancing convenience without affecting travel speed.

- Discounted Oyster variants for seniors, students and disabled commuters support equity and accessibility.

- The backend system is highly secure, with encrypted card readers and near-instant fare verification, even during peak hours or in low-connectivity zones.

Together, these features have contributed to TfL's reputation as a leader in fare integration, where affordability, ease of use and system robustness all converge.

5.5 Impact of oyster cards and Contactless payments

The introduction of the Oyster Card in 2003 significantly transformed the landscape of public transport in London, setting a global precedent for efficient, contactless fare management. Over the past two decades, its influence has extended far beyond mere ticket replacement—it has streamlined fare collection, improved rider satisfaction, reduced operational costs and enhanced data-driven decision-making within TfL.

5.5.1 Benefits to transport agencies

The Oyster and contactless payment system has brought significant immediate and long-term operational advantages to TfL and its affiliated agencies. One of the standout impacts has been the reduction in revenue collection costs. Before the introduction of Oyster, cash handling and paper tickets incurred high administrative and processing overheads. With digital validation, these costs dropped from 15% to 8%, with targets to further lower this to 6% through greater adoption of contactless modes. Enhanced fare security and reduced fraud risk have also been achieved through smart validation systems and encrypted readers, resulting in a fare evasion rate of just 3.9% in 2022–23, notably lower than many other metropolitan transport networks. Improved cash flow and real-time settlement mechanisms have made budgeting and operational planning more responsive, as contactless transactions are settled quickly, eliminating delays associated with manual fare reconciliation. Additionally, the system has enabled data-rich analytics, helping TfL make better decisions regarding route frequency, vehicle allocation and infrastructure investment based on granular travel pattern data. Furthermore, contactless systems have reduced queue

dwell time, especially at entry points, improving throughput during peak hours and enabling more predictable service operations.

5.5.2 Benefits to passengers

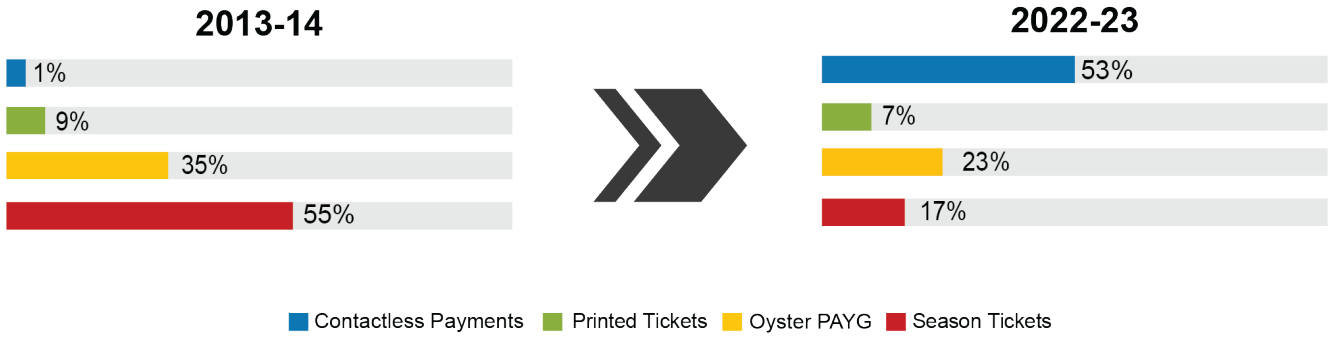
The Oyster and contactless fare systems have delivered numerous conveniences to commuters, significantly lowering barriers to mobility. One of the early benefits was pricing; studies showed that equivalent journeys using Oyster could be up to 40% cheaper than single cash fares. The introduction of fare capping ensured that passengers never paid more than the daily or weekly maximum, providing peace of mind and financial predictability, especially for daily riders. Seamless multimodal travel became a reality, allowing users to switch between buses, the Underground, DLR, Overground and even river services without needing to purchase new tickets for each leg of the journey. The support for contactless payments across a wide variety of devices—phones, watches, key fobs and NFC-enabled cards—ensured maximum flexibility in how users accessed the system. Additionally, TfL catered to inclusivity with Oyster variants for different groups, offering discounts to seniors, students, apprentices and people with disabilities.

5.5.3 Payment trends

The payment trends in London's public transport system have evolved significantly over the years, with contactless payments emerging as the most dominant method by 2022-23, accounting for approximately 53% of all payments. This shift towards contactless payments reflects passengers' growing preference for more convenient and flexible payment options, enhancing the overall efficiency and reliability of London's public transport system. Oyster Pay-As-You-Go (PAYG) still plays a significant role, making up 23% of payments, while season tickets account for 17% and printed tickets for 7%.

Usage trends over time illustrate how Oyster and contactless methods became the preferred fare media across London's public transport ecosystem. By 2022-23, 76% of all TfL payments were made through contactless cards or devices, marking a significant shift from traditional Oyster and paper-based methods. In the early years post-launch, Oyster dominated and by 2013, it was used in 85% of all rail and bus travel in London. Over 60 million Oyster cards were issued within a decade, remaining relevant for users eligible for concessionary fares or those who prefer prepaid options. The total value of contactless fare transactions reached £20.3 million daily by 2023, highlighting the robustness and scalability of the system. Despite the rise in contactless adoption, Oyster still accounts for 23% of total payments, especially among daily commuters who prefer stored-value control.

This evolution in payment methods has not only streamlined fare collection but also set a benchmark for other cities looking to modernise their public transport systems. The integration of contactless payments has made commuting more convenient and efficient, reflecting a broader trend towards digital solutions in urban mobility.



Contactless payments have emerged as the most dominant payment system in recent times compared to season tickets being the most preferred payment system.

Figure 23: TfL payment trends over years

Sources: TfL Data and GIZ Experts

06

India's National Common Mobility Card (NCMC)

6.1 Background

India's National Common Mobility Card, also known as NCMC was launched in 2019 by the Ministry of Housing and Urban Affairs (MoHUA) with the objective of enabling seamless travel across different modes of public transport through a unified payment system. The initiative was aimed at addressing the longstanding issue of fragmented fare collection systems across Indian cities, where passengers often had to switch between various ticketing systems while using metros, buses and suburban rail.

The NCMC was envisioned as a "One Nation, One Card" solution to eliminate this inefficiency and promote interoperability. Built on the RuPay card platform by the National Payments Corporation of India (NPCI), NCMC functions not only as a travel card but also as a debit card, enabling payments across retail, e-commerce, parking and toll segments. This dual-functionality reflects the government's broader digital India vision, integrating banking and transit functions into a single smart card.

6.2 Features

The NCMC card is equipped with advanced technology to facilitate both contact and contactless transactions. It adheres to the EMV standard, a global benchmark for secure and interoperable payment transactions using chip cards, developed by Europay, MasterCard and Visa. Additionally, it incorporates NFC technology, enabling 'tap-and-go' functionality for quicker boarding and reduced wait times at access gates.Some of the defining features of the NCMC include:

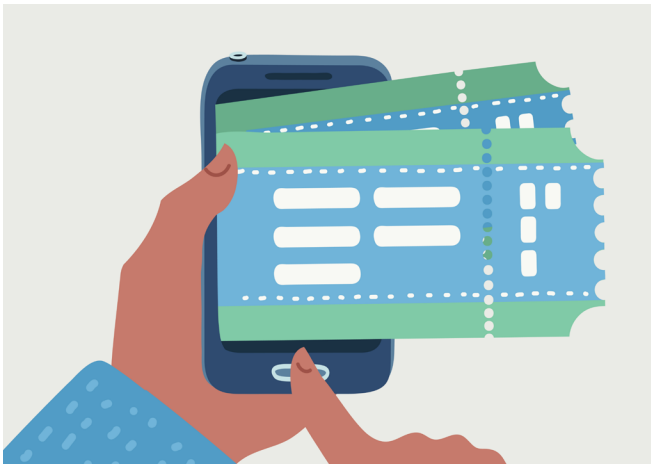
i. **Dual interface:** The card supports both contact and contactless payments, allowing it to be used at Automated Fare Collection (AFC) gates as well as at Automated Teller Machines (ATMs) and merchant Point-of-Sale terminals.

ii. **Offline wallet functionality:** One of the most critical features is the ability to support offline transactions for transit payments, even when network connectivity is unavailable. This reduces transaction delays in high-traffic public transport environments.

iii. **Full banking functionality:** The NCMC can be linked to a user's savings or prepaid account, enabling debit/credit functionality in addition to transport fare payments.

iv. **Interoperability:** It can be used across different cities and services, aiming to become a nationwide standard for all modes of transport.

v. **Minimal KYC requirement:** NCMC cards can be issued with limited KYC, ensuring financial inclusion for a broader population base.



6.3 Types of NCMC cards

NCMC is not a single product but a family of cards that issuers can design with varying capabilities:

I. **Prepaid cards:** Issued with a loaded balance, primarily used for fare payments and other merchant transactions.

II. **Debit cards:** Linked directly to the user's bank account, allowing both fare and regular transactions from the same card.

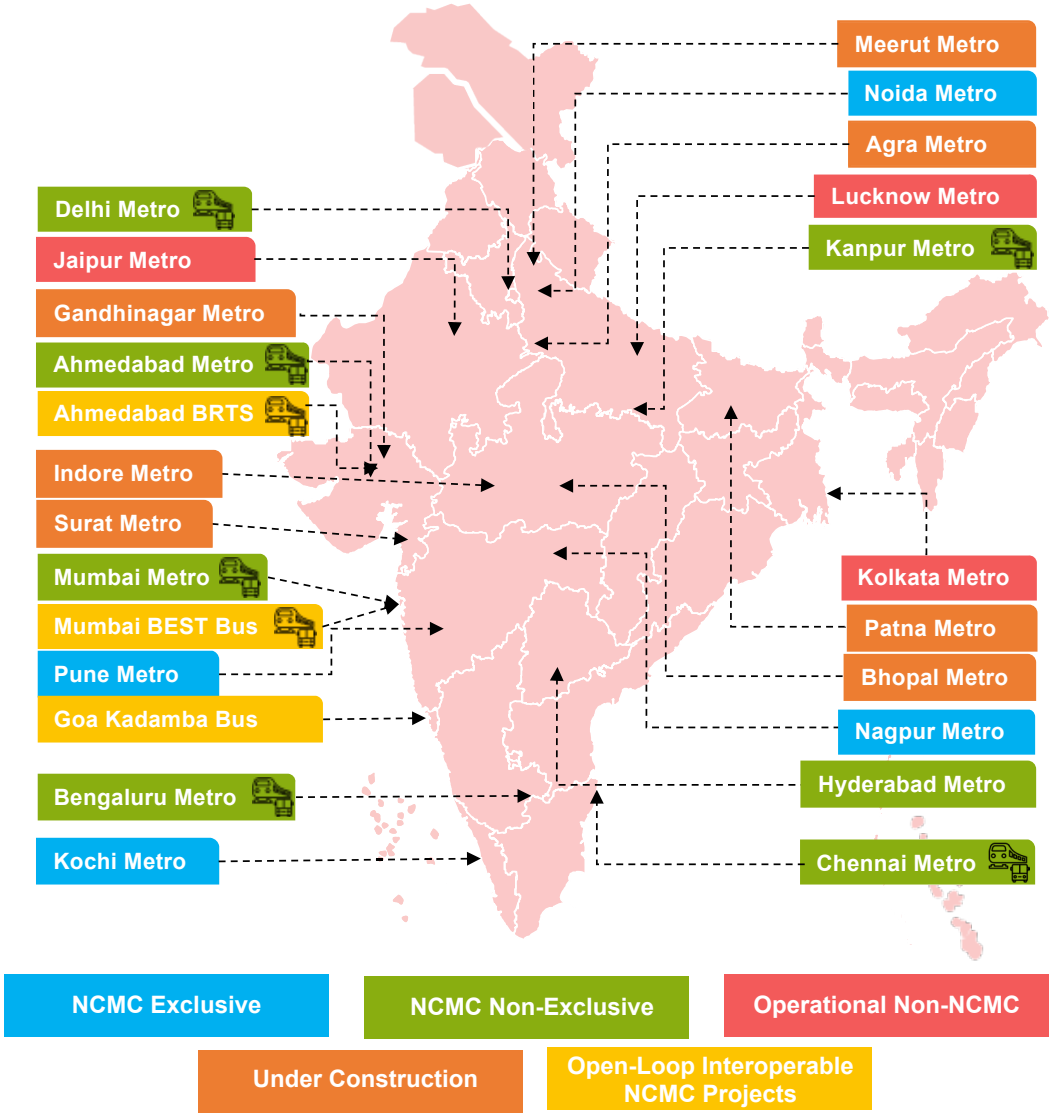
III. **Credit cards (selective):** Some banks have begun integrating NCMC features into credit cards to offer extended payment flexibility.

These cards are issued by major Indian banks, such as SBI, ICICI, Axis Bank and PNB, in partnership with NPCI. The card design, issuance norms and user interface may vary slightly by bank, but all cards adhere to NCMC technical specifications.

6.4 NCMC cards across India

The rollout of NCMC cards has been gradual, with increasing adoption in metro systems and urban transport agencies. However, interoperability and uniform implementation remain a work in progress.

The NCMC system is categorised into several groups:



Disclaimer: This geographical map is for informational purposes only and does not constitute recognition of international boundaries or regions; GIZ makes no claims concerning the validity, accuracy or completeness of the maps nor assumes any liability resulting from the use of the information therein.

Figure 24: NCMC implementation across India

Source: NPCI

- **NCMC exclusive:** These metro systems exclusively use NCMC for fare collection, streamlining public transportation and reducing the need for multiple payment methods. Cities in this category include Noida, Pune, Kochi and Nagpur.

- **NCMC non-exclusive:** These metro systems are operational and accept the NCMC for fare payment. However, these are not exclusive to the NCMC, they accept other forms of payments such as cash, tokens or their close loop card. Cities in this category include Delhi, Mumbai, Ahmedabad and Kanpur.

- **Operational non-NCMC:** These metro systems do not accept NCMC cards and have their own independent fare collection systems such as close-loop smart cards, tokens or cash. Cities in this category include Jaipur, Kolkata and Lucknow.

- **Under construction:** These metro projects are currently non-operational or under development but may eventually integrate NCMC upon completion. Cities in this category include Patna, Bhopal and Indore.

- **Open-loop interoperable NCMC projects:** This refers to the use of a standardised card that allows passengers to access multiple modes of transport across different cities without needing separate cards for each city's transit system.

Buses in cities like Mumbai, Ahmedabad and Goa have also begun accepting NCMC cards as part of broader open-loop interoperability pilots. However, full acceptance across buses, metros and suburban trains remains limited due to differences in AFC infrastructure, legacy systems and operational readiness.

6.5 Operations and mechanism

The NCMC transaction flow revolves around the NPCI payment switch, which manages settlements between issuing and acquiring banks. A typical fare payment begins when a commuter taps their card at a metro/bus gate or PoS terminal, initiating a transaction request. The card reader then authenticates the card, checking for stored value or linked bank account availability. If offline processing is supported, the fare may be deducted directly from the offline wallet, allowing real-time processing even without network connectivity. The transaction is logged and later settled through the acquiring bank to NPCI, which clears it with the issuing bank. Funds are then transferred and reconciled with the transit agency, usually on a Transaction + 1 day basis (next business day). This architecture balances speed, security and scalability, while the back-end system provides valuable analytics on ridership, fare trends and card usage to support strategic decision-making by transport authorities.

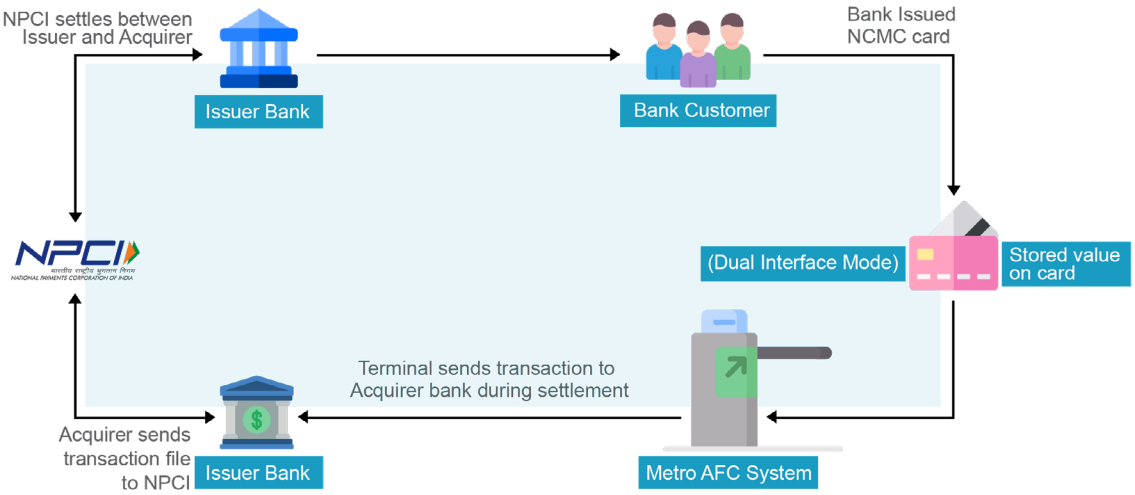


Exhibit 25: Mechanism of NCMC payments

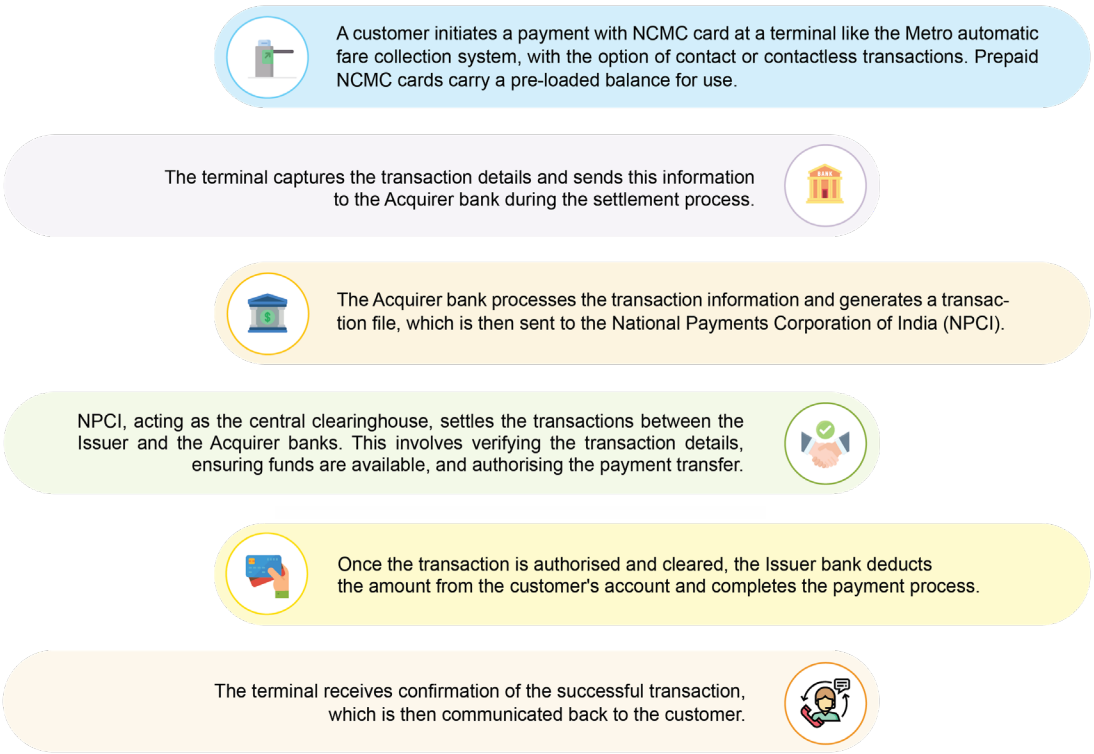


Figure 26: Mechanism of NCMC payments

07

Surat Money Card

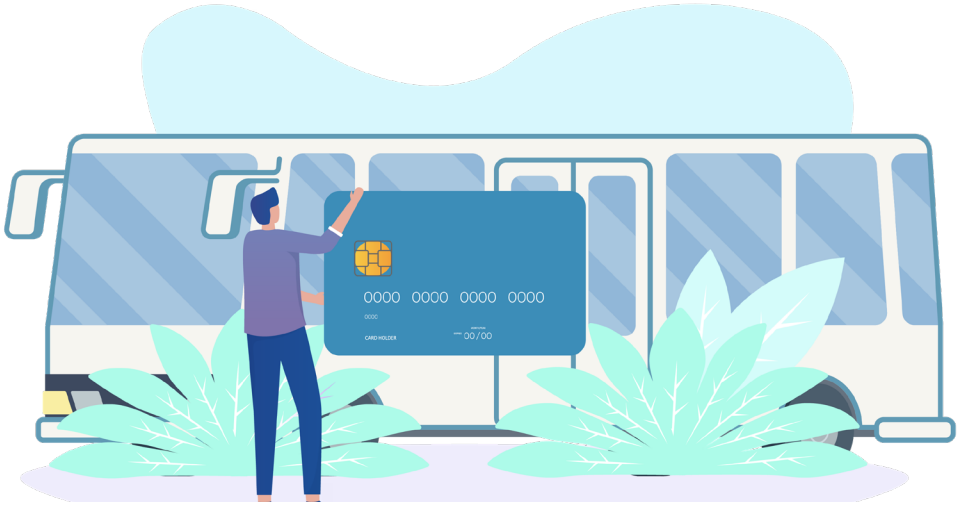
7.1 City profile

Surat, one of India's fastest-growing cities, has seen remarkable growth over the decades. Known for its thriving textile and diamond industries, Surat's population has surged from 1.1 million in 1984 to approximately 7.8 million in 2023[1]. The city's strategic location along the Tapi River has historically made it a key commercial and trading centre.

Today, Surat boasts dynamic economic activities, a substantial industrial base and a rapidly growing urban population. With an average GDP growth rate of around 9.2%[2], Surat ranks as India's ninth richest city. This economic prosperity has led to significant advancements in the city's mobility landscape, catering to the rising travel demand.

The city's expansion is evident in its increased area from 111 square kilometres in 1986 to 462 square kilometres in 2020[3]. Vehicle ownership has also skyrocketed, with the number of vehicles rising from 125,000 in 1984 to 7.5 million in 2023[4]. Despite the low public transport modal share, Surat has made considerable efforts to enhance its public transport system, including a robust bus network and the addition of a metro network. These developments aim to reduce traffic congestion and pollution, addressing the challenges posed by the city's rapid growth and urbanisation.

[1] Macrotrends - https://www.macrotrends.net/global-metrics/cities/21412/surat/population
[2] Resilient Cities Network - https://resilientcitiesnetwork.org/wp-content/uploads/2023/07/Surat-TFURP-Project-Logic.pdf
[3] SMC - https://www.suratmunicipal.gov.in/TheCity/City/Stml1
[4] Vaahan Portal



7.2 Surat's public transport system

The inception of public transport in Surat gained momentum post-2013[5], with the establishment of BRTS corridors and a network of city buses. Currently, the city has 795 buses operating on 56 bus routes with an average daily ridership of 2.6 lakhs[6]. There are 450 E-buses operational in Surat with an aim of 100% electrification by 2025[7]. Surat operates the largest segregated Bus Rapid Transit (BRT) network in India of 110 kms with 100% E-buses operating on the BRT routes[8]. Further, to enhance the public transport experience in the city and offer enhanced connectivity, the city has planned for a metro network of 40 kms[9]. The two corridors are planned to offer north-south and east-west connectivity to the city.

7.3 Emergence of Surat money card

Launched in February 2018[10] through a partnership with ICICI Bank, the Surat money card was one of the first city-led mobility cards linked to the RuPay platform. It was designed as a multipurpose card that would allow seamless fare payments on BRTS and city buses and extend to non-transit use cases like retail purchases, library membership, tax bill payments and access to recreation facilities. The card was positioned as an inclusive solution catering to a diverse user base including students, women, senior citizens and the differently abled[11,12].

Non-Personalised Card

Personalised Card

Figure 27: Surat Money Card

[5] CEPT University - https://cept.ac.in/184/center-for-excellence-in-urban-transport-coe-/news/175/sitilink-surat-brts-starts-trial-runs
[6] SMC
[7] SMC - https://www.suratmunicipal.gov.in/Departments/BRTSEleBusOperations
[8] Bhaskar English - https://www.bhaskarenglish.in/local/gujarat/ahmedabad/news/brts-expansion-stops-no-new-corridors-to-be-built-134645130.html
[9] SMC - https://www.suratmunicipal.gov.in/Departments/ProjectsUnderPlanningTendering
[10] MySurat - https://mysurat.in/blogdetail.htm?2/smc-likely-to-launch-s-money-card
[11] ICICI - https://www.icicibank.com/personal-banking/cards/prepaid-card/surat-money-card#:~:text=ICICI%20Bank%20and%20Surat%20Municipal,E%2Dcommerce%20transactions.
[12] SMC https://www.suratmunicipal.gov.in/Services/SuratMoneyCard

7.4 Features of Surat money card

The Surat money card is available in both personalised and non-personalised variants, making it accessible across socio-economic segments. It is a prepaid, contactless card that can be easily recharged both online and offline.

Key features include:

- **Tap-in tap-out functionality:** For city buses and BRTS, fare is calculated based on origin-destination logic. The AFC system deducts fare upon tapping out, ensuring accuracy.
- **Discounted fare structures:** Students receive up to 40% concession, while women and senior citizens receive 25%. Differently abled persons and freedom fighters benefit from a 100% fare waiver.
- **Multiple usage:** Beyond transit, the card is accepted for payments at civic centres, recreational clubs, libraries, malls and select retail outlets.
- **Account access:** Citizens can check balance, manage statements and top-up the card via the online portal, mobile app or physical service centres.
- **Secure transactions:** Equipped with 3D Secure PIN, transaction alerts, encryption protocols and real-time recharge options.

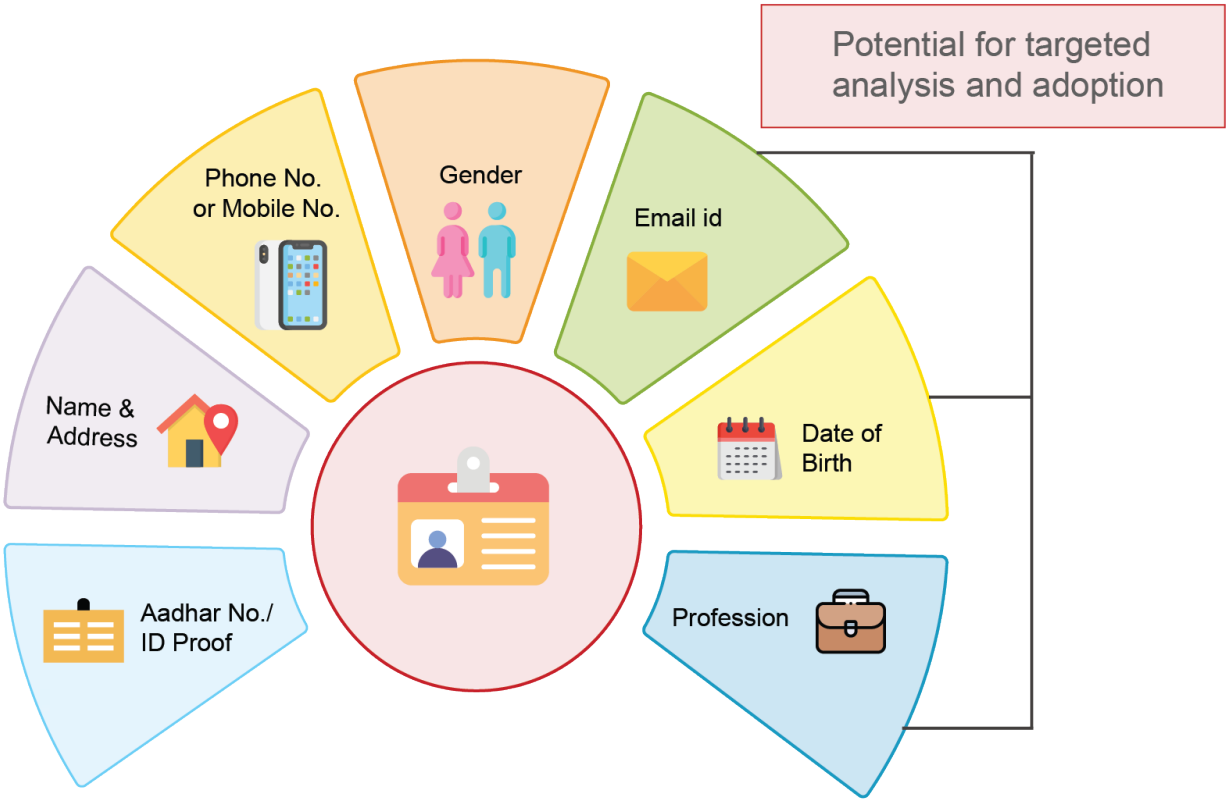


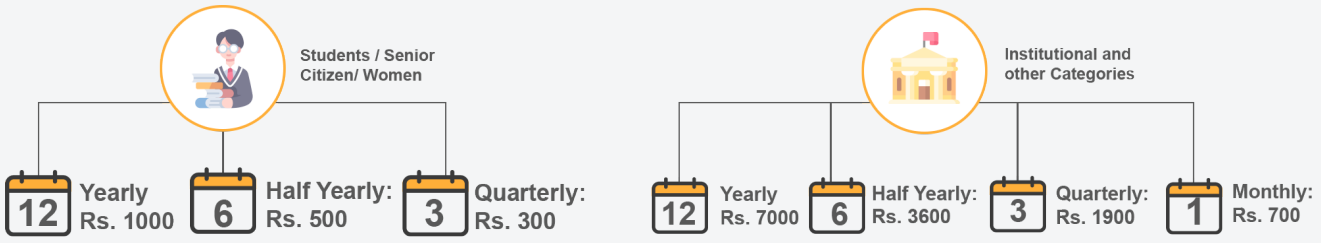
Figure 28: Details collected as part of personalised Surat money card

7.5 Features of Surat travel passes

The SARAL Travel Pass and Shramik Pass Scheme are key offerings linked to the Surat money Card:

SARAL pass: Available to students, women and senior citizens, this scheme allows unlimited travel across SMC's public transport services. Pricing is kept affordable — yearly at ₹1,000 for students and ₹7,000 for institutional users.

Shramik pass: Launched with the Gujarat Labour Welfare Board, this scheme offers free travel to registered construction workers. It is a socially inclusive initiative using the Surat money card as the medium of authentication and subsidy delivery.



SARAL Pass Travel Scheme is for personalised Surat money card only

Figure 29: SARAL travel passes pricing

7.6 Operations and mechanism

The card operates on a prepaid logic managed through the RuPay/NPCI network. Upon tapping at the AFC gate, the terminal checks for minimum balance and deducts the fare based on travel data. In case of non-personalised cards, the identity of the rider is not linked, making it ideal for general public use. For personalised cards, especially those used under subsidised schemes, identity verification ensures proper allocation of benefits.

Recharges can be made both online via UPI, debit/ credit card, NEFT and net banking and offline via Smart card counters at high-footfall BRTS stations and ICICI Bank branches.

7.7 Surat money cards' payment system

7.7.1 Modes supported

The Surat money card is a versatile card accepted across a wide range of city services, providing seamless access to various civic functions. It is extensively used for fare payments in the BRTS and city bus networks, forming the backbone of Surat's transit fare system. Additionally, citizens can use the card for payments at Surat Municipal Corporation civic centres, including taxes and utility bills. Beyond transit and utility payments, the card is also accepted at selected retail outlets, recreational facilities, swimming pools and libraries, making it much more than just a transit card.

Figure 30: Modes supported by Surat Money Card

7.7.2 Features

The Surat money card is available in both personalised and non-personalised variants. Personalised cards are required to avail concessional benefits, while non-personalised versions support basic tap-and-go usage. The system is also equipped with a robust back end that allows real-time account access through a dedicated portal and mobile application, online top-up functionality via UPI, credit/debit cards, NEFT, RTGS and net banking and secure transactions compliant with RBI guidelines, including Personal Identification Number (PIN) authentication, transaction alerts, encrypted data and block/re-issue options.

In terms of inclusivity, the card system offers tiered discounts: 40% for students, 25% for women and senior citizens and 100% for differently abled persons and freedom fighters. This ensures equitable access to the public transport system and fosters greater financial inclusion.

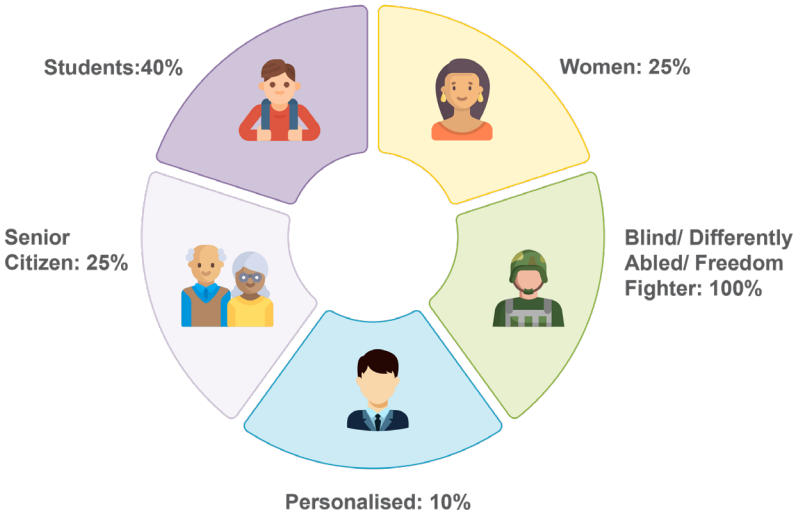


Figure 31: Discounts offered by Surat money card

Source: Surat Municipal Corporation

7.8 Impact of Surat money card

7.8.1 Benefits to transport agencies

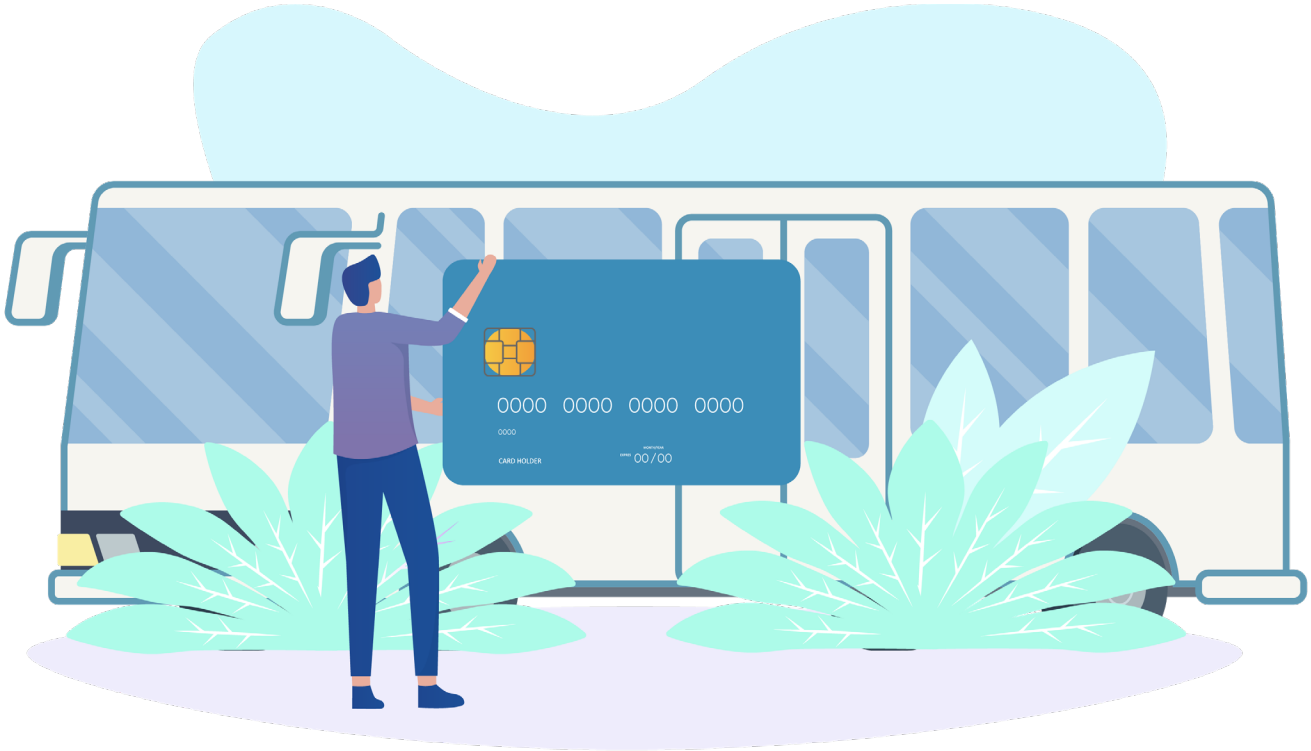
Smart money cards offer significant advantages to transport agencies. Firstly, e-commerce online payments are streamlined as SMC ensures that all transactions adhere to established RBI guidelines, making the process secure and efficient. Additionally, the low merchant costs associated with SMC are a notable benefit; transport agencies only pay 1.95% of the transaction amount as part of their merchant services. Simplified revenue settlements are additional benefits given SMC's automatic settlements on a T+1 basis, which enhances cash flow management by ensuring timely fund availability. Furthermore, reduced cash handling costs, streamlined fare reconciliation and enhanced ridership analytics are additional benefits.NEFT,

7.8.2 Benefits to passengers

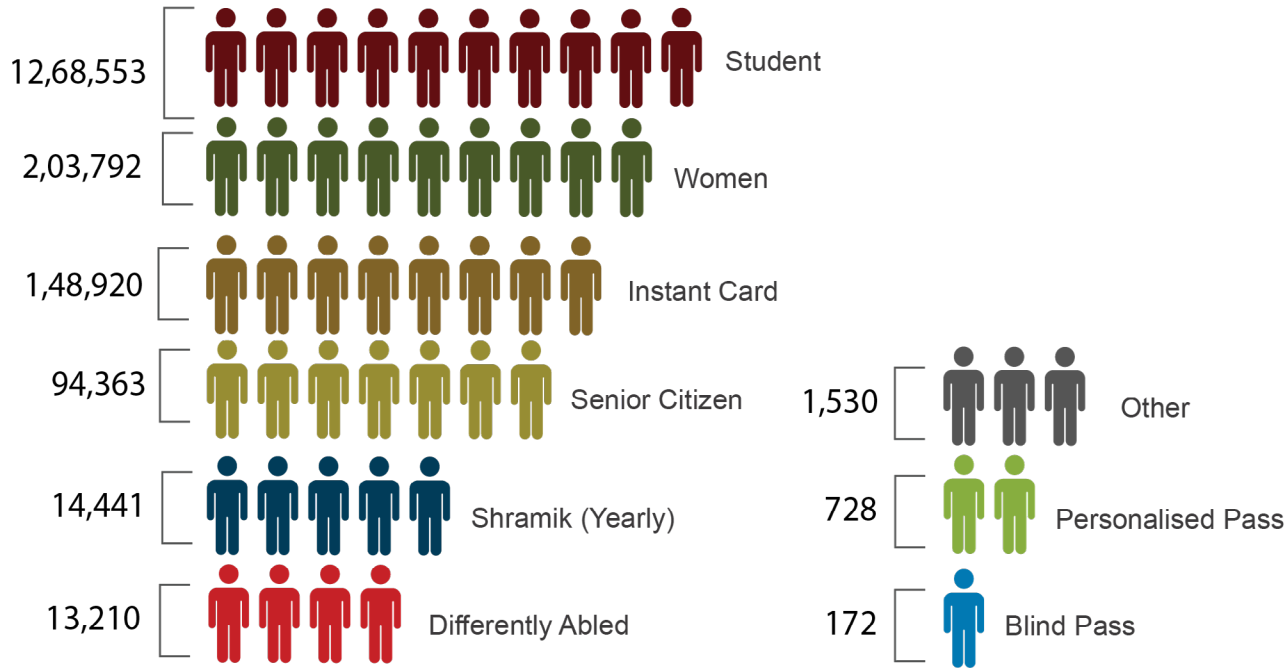
Passengers benefit from the convenience and affordability the card system offers. Tap-in/tap-out makes travel faster and more seamless, while concessional rates offer tangible financial savings. Furthermore, the online recharge and transaction-tracking features provide transparency and user autonomy. Passengers no longer need to carry cash or worry about paper tickets, especially during peak hours. The use of a single card across transit and civic facilities also reduces the burden of managing multiple modes of payment.

7.8.3 Payment trends

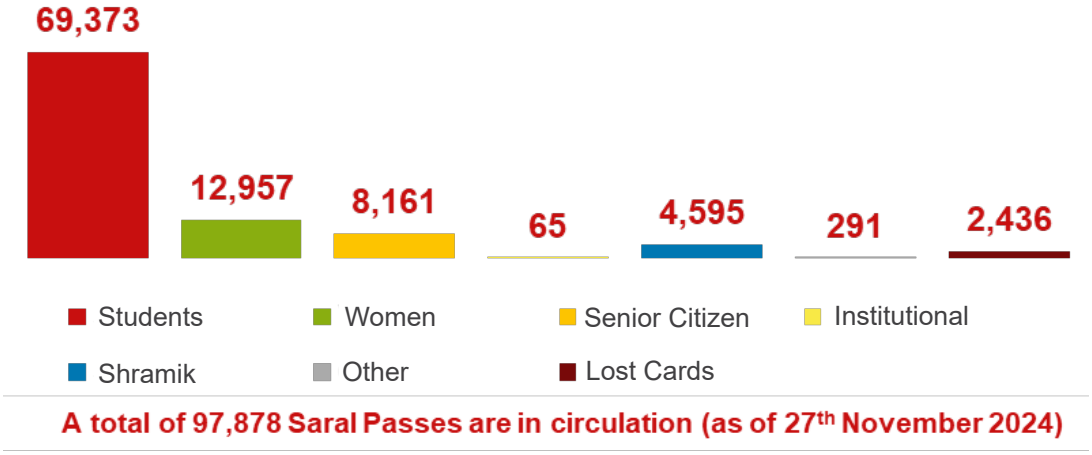
The Surat money card has shown significant growth and diverse usage patterns since its launch in February 2018. The card is widely used for various transactions, with ticketing transactions emerging as the most popular transaction with INR 4.97 crore worth of transactions, followed by retail transactions with INR 1.97 crore worth of transactions. As of 2023, over 1.68 lakh cards were in circulation, with a significant rise in card usage over the years—from approximately 6 thousand cards in 2018 to more than 1.68 lakh cards in 2024. This growth reflects both expanded utility and increasing public trust. Moreover, the system achieved a 100% transaction success rate, attributed to the pre-approved nature of the cards and efficient digital architecture. Card top-ups and ticketing payments accounted for the largest share of transactions.



Surat Money Cards in Circulation



Saral Passes in Circulation



Annual Cards in Circulation

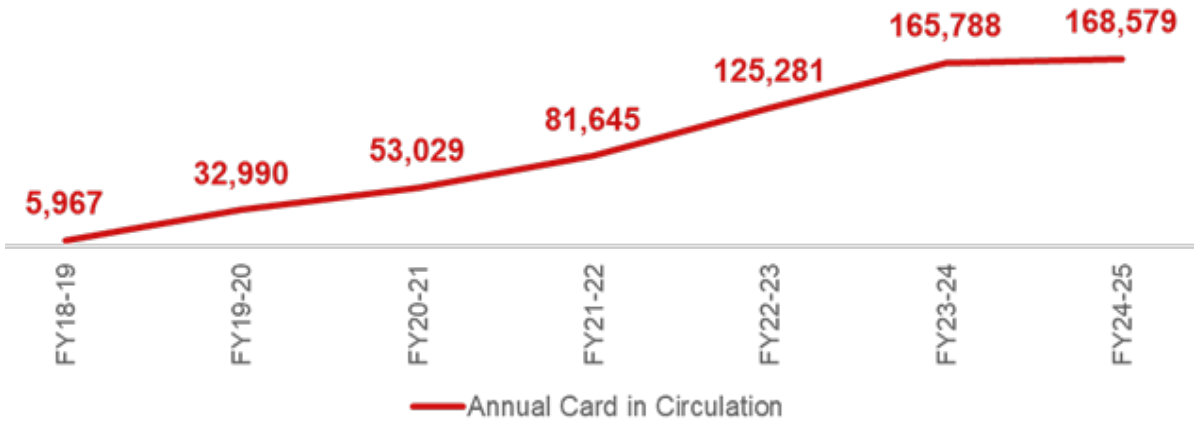


Figure 32: Surat money cards in circulation 2018

Source: Surat Municipal Corporation

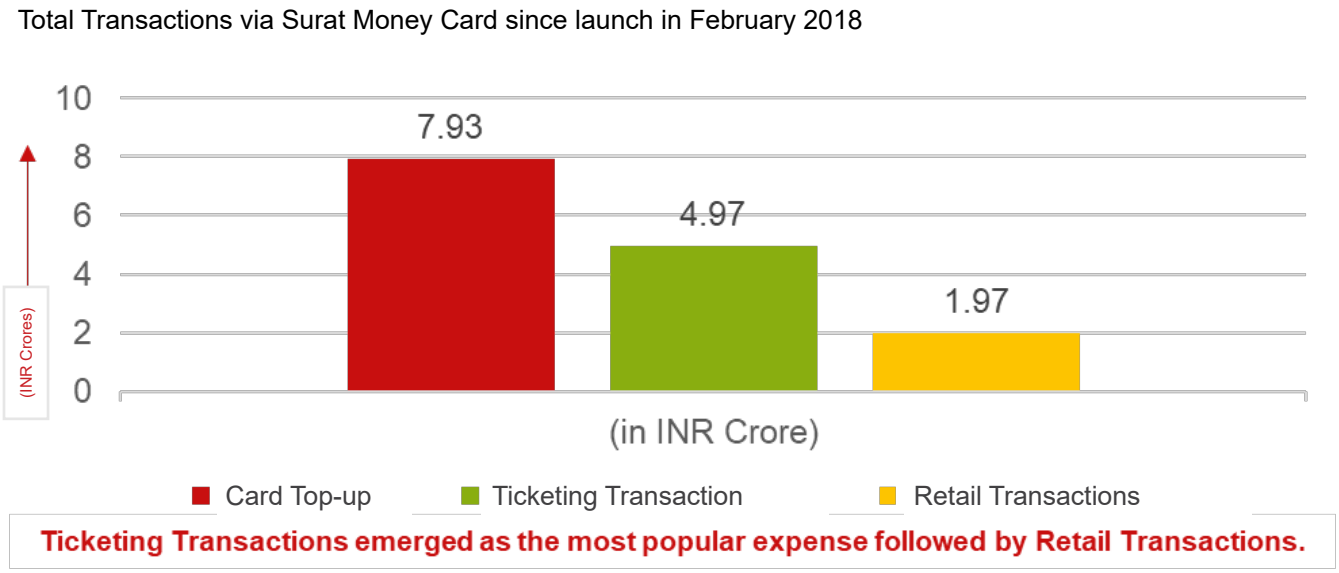


Figure 33: Total transactions via Surat Money Card since launch in February 2018

Source: Surat Municipal Corporation

In terms of financial performance, the card has seen a steady increase in the number of transactions and the total transaction amount per year. The card top-up amount has also grown, reflecting the increasing reliance on the Surat Money Card for daily transactions. The demographic data collected by SMC shows a diverse user base, including students, women, senior citizens, and workers, which underscores the card's broad appeal and utility.

Overall, the Surat Money Card has become an integral part of the city's payment ecosystem, offering convenience and efficiency to its users while supporting various city services and businesses.

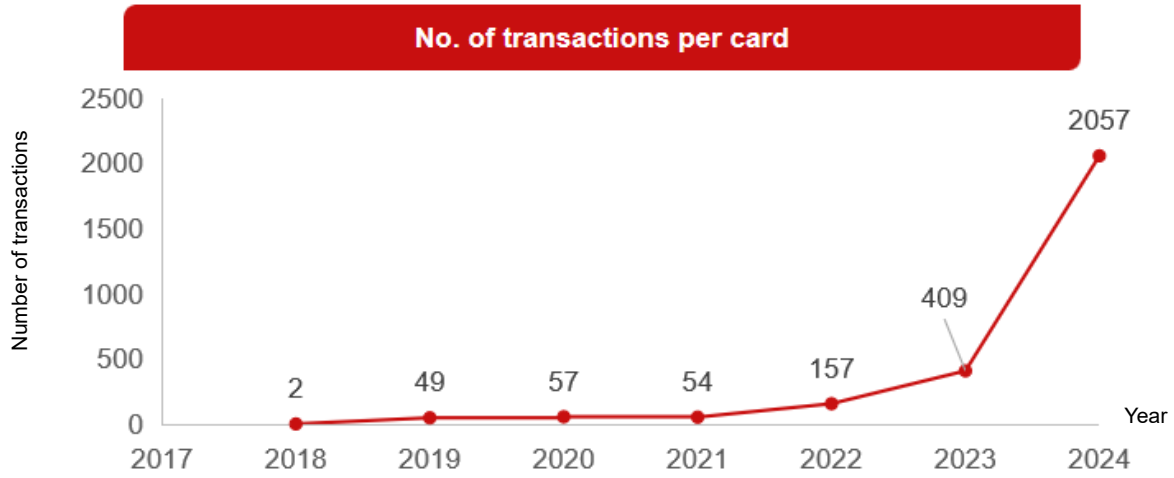


Figure 34: No. of transactions per year per card

Assumption: The number of cards for each financial year (FY) was considered equivalent to the number of cards for the corresponding calendar year (CY). For instance, the cards for FY 2018-19 were assumed to align with the count for CY 2018.

Source: Surat Municipal Corporation

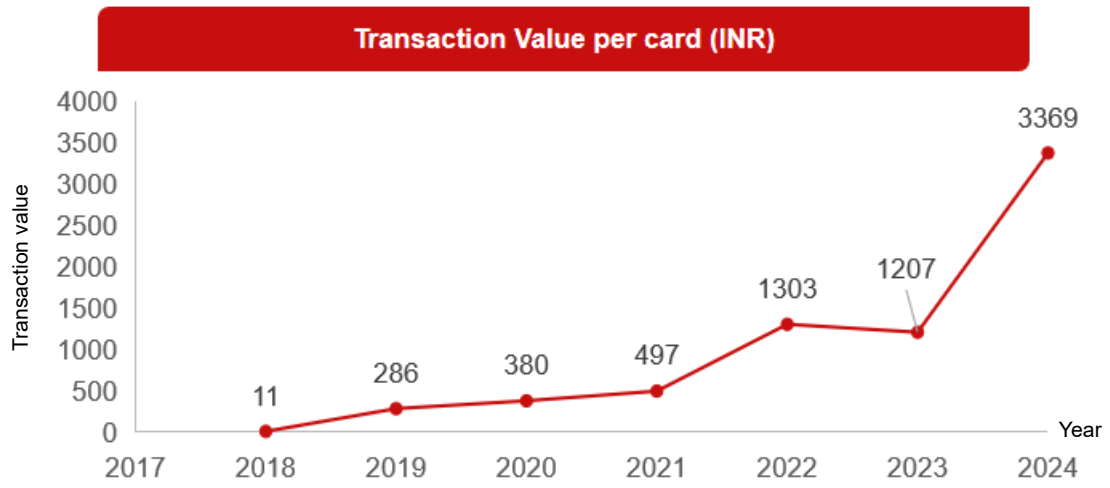


Figure 35: Total transaction amount per year per card (INR)

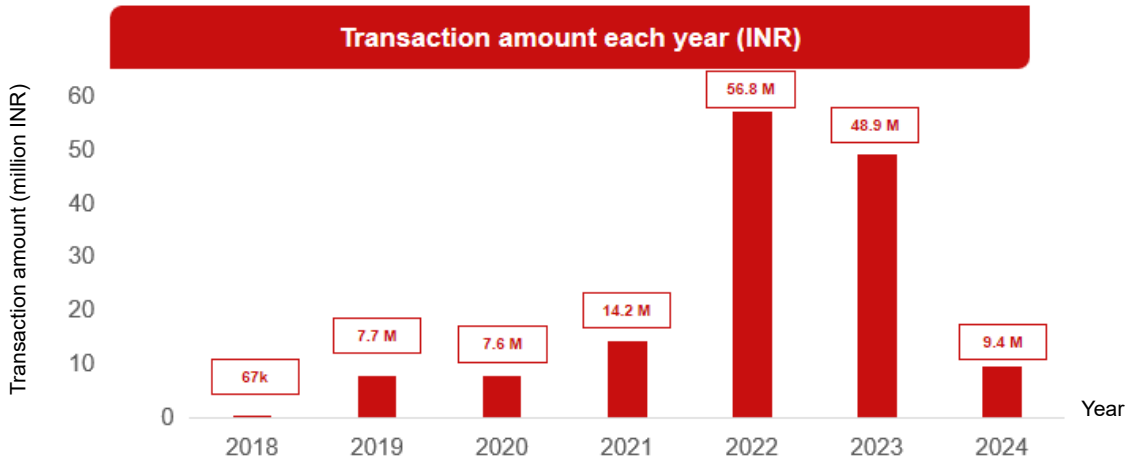


Figure 36: Total transaction amount per year (in INR)

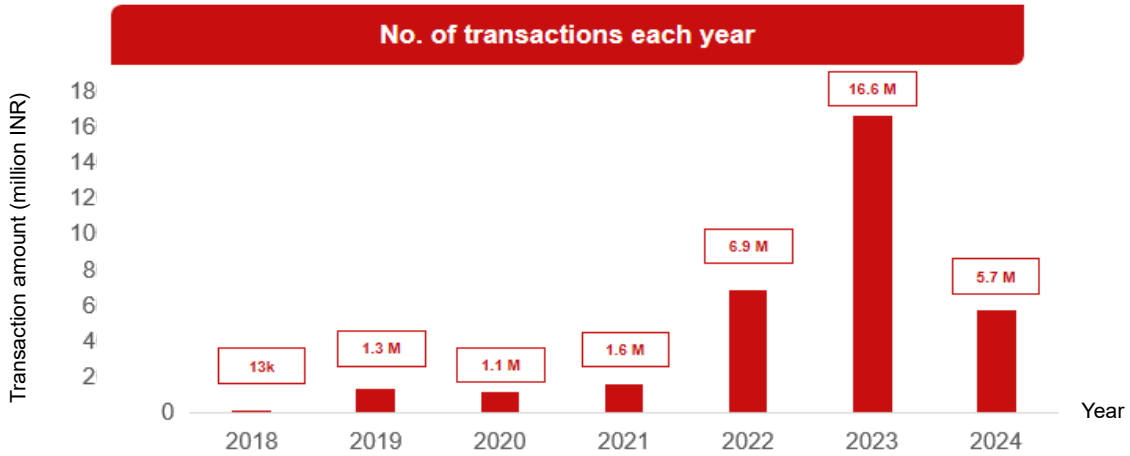


Figure 37: Number of transactions per year (in INR)

Assumption: The number of cards for each financial year (FY) was considered equivalent to the number of cards for the corresponding calendar year (CY). For instance, the cards for FY 2018-19 were assumed to align with the count for CY 2018.

Source: Surat Municipal Corporation

7.9 Challenges in integration of fare payment system in Surat

While the Surat money card has succeeded in digitising fare collection and enabling multimodal utility, several implementation-level challenges continue to hinder its full potential. These challenges are both structural and user-centric, especially in the context of integrating fare systems citywide under a single, seamless platform.

A primary barrier is the requirement for full KYC compliance during personalised card issuance. While this is understandable in financial or high-value contexts, applying it to public transport—where individual ticket values are often nominal—becomes an overburden for citizens. Users are discouraged from accessing discounts or adopting the card entirely, particularly when they need it for casual or short-term travel.

Key Challenges:

- **Onboarding friction due to KYC requirements:** Personalised cards, which are necessary to avail subsidies and concessions, require users to complete a time-consuming and documentation-heavy KYC process. For commuters who travel infrequently or for short distances, this step is seen as disproportionate to the benefit received.

- **Limited card acceptance across platforms:** Although Surat Money Cards work well within municipal transit and civic utility systems, they are not yet accepted outside these silos. This lack of interoperability discourages adoption, especially for users expecting universal applicability similar to a bank-issued debit or credit card.

- **Dependence on closed-loop system:** The existing fare payment architecture is primarily a closed-loop system, which means the card can only be used within a predefined network (e.g., SMC-run services). This limits freedom for passengers and undermines the goal of integrated urban mobility.

- **Visitor and migrant exclusion:** Daily wage earners, seasonal workers and tourists often avoid using the card due to the formality and rigidity of the system. The lack of immediate, easy-to-use options for short-stay or new users restricts inclusivity.

- **Technological fragmentation:** The absence of a unified platform that brings together multiple modes (BRTS, city buses, metro in future) under one standard payment framework complicates real-time data collection, inter-modal travel planning and fare synchronisation.

To address these challenges, Surat must transition toward open-loop systems that accept a wide range of contactless cards—whether issued by ICICI, SBI or any other NCMC-compliant institution. This would not only simplify access but also eliminate the need for dedicated KYC processes for low-value transport transactions. Additionally, it would pave the way for aggregator-led models, where passengers can manage travel across various modes using a single digital interface—mirroring successful systems in cities like London.

08

Learnings from Transport Payment Systems

The case studies of Hong Kong and London provide valuable insights into integrated single ticketing systems. In terms of launch strategy, Hong Kong's approach involved onboarding diverse modes of transport by forming joint ventures for payments, while London's strategy focused on adopting diverse payment methods to broaden the user base. For customer acquisition, Hong Kong instituted flat-rate pricing across all transport modes except taxis to simplify fare structures, whereas London put in place a policy capping travel costs for frequent travellers to encourage usage.

In ticketing strategy, Hong Kong's clearinghouse model validated fares in 4-7 days with revenue sharing agreements acceptable to all transport companies. Conversely, London's system allowed instant revenue sharing agreements with immediate settlement through an open-loop system using contactless bank cards. Lastly, mode onboarding strategies showed that Hong Kong emphasised real-time data sharing for better decision-making across multiple services while London's use of analytics improved transport planning by understanding passenger behaviour patterns.

These complementary learnings highlight the importance of collaboration between different transport modes and payment systems to create an efficient integrated single ticketing system that benefits both operators and passengers.

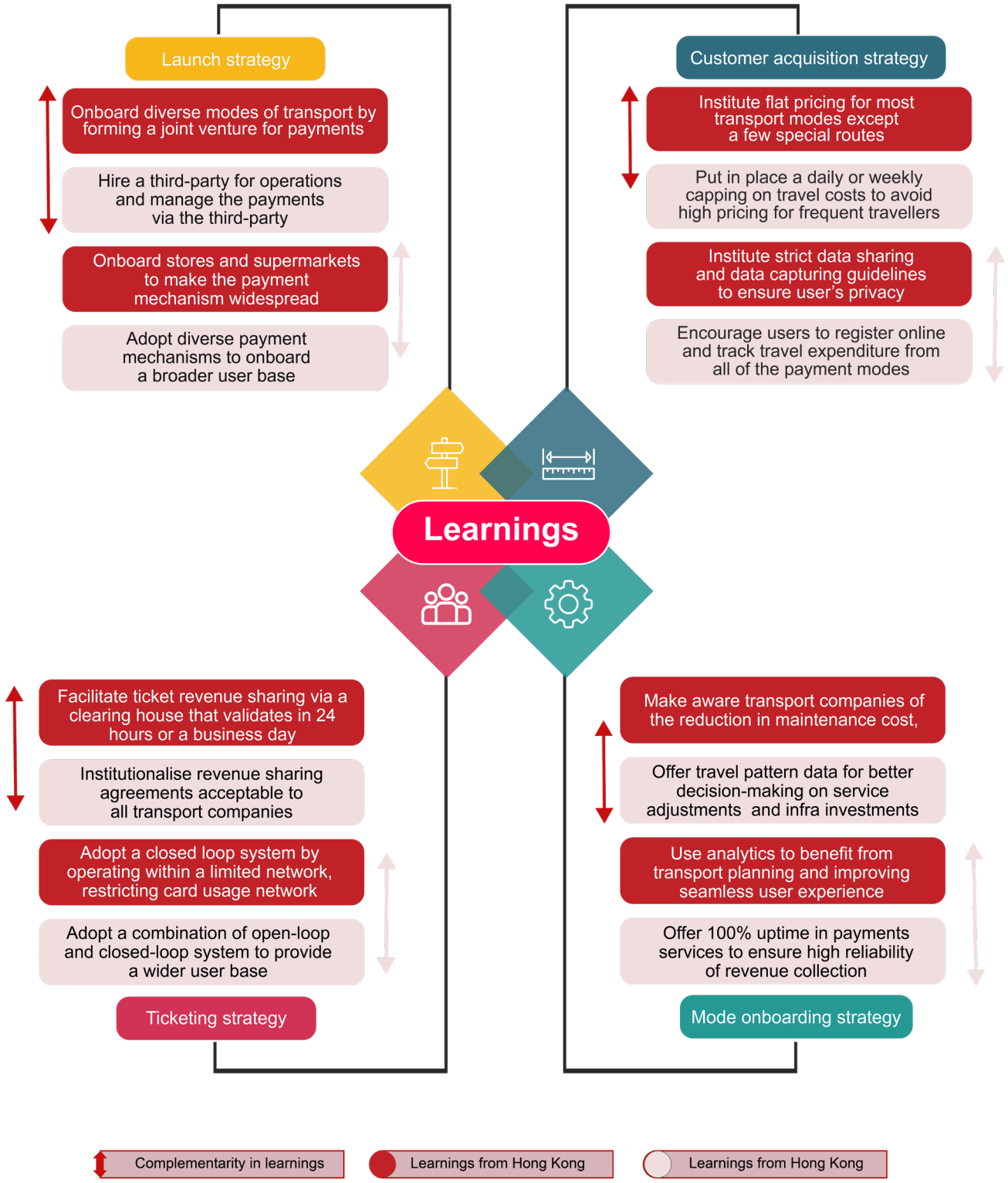


Figure 38: Learnings from Hong Kong and London's payment system

09

Workshop in Surat

9.1 Context setting

To address the key challenges associated with achieving seamless integration across various public transport systems, SMC and Sitilink organised a workshop on “Avenues of Optimising Integrated Digital Singkle Ticketing and Contactless Payments Systems”, supported under‘Promotion of Transformation to Sustainable and Climate Friendly Urban Mobility” project of GIZ India on 4th December 2024 in Surat. The aim of the workshop was to overcome the challenges associated with implementing the integrated single ticketing systems and achieve the objective of enhancing user experience and operational efficiency of Surat’s public transport system.

The focus of the discussion was to understand the current challenges, experiences with such ventures and explore potential avenues for partnerships. This workshop brought together representation from Surat Municipal Corporation, including public transport agencies such as BRTS, Sitilink and Surat Metro, technology providers such as Integrated Command and Control Centre (ICCC) and Nippon Electric Company (NEC) and other relevant stakeholders, facilitating a collaborative environment for open discussion and strategic planning.

9.2 Emerging themes from the discussion

The workshop brought together key stakeholders from public transport agencies, government bodies and technical experts, fostering a collaborative environment for strategic discussions on Surat’s path toward integrated and seamless urban mobility. Several critical themes emerged during the sessions:

Development of integrated single ticketing systems: Participants strongly advocated for the implementation of a unified single-ticketing system across all public transport modes, including bus and metro, to offer commuters a seamless travel experience. Case studies from Hong Kong’s Octopus Card and London’s Oyster Card illustrated the transformative impact of such systems in increasing public transport penetration and improving fare collection efficiency. The potential for Surat to adopt similar systems—particularly the NCMC and Surat Money Card—were discussed in detail.

- **Policy and institutional support:** The discussions stressed the need for clear policy direction, streamlined regulatory processes and inter-agency collaboration to facilitate the successful rollout of integrated single ticketing. Strong data security protocols and user privacy safeguards were highlighted as essential components, along with government-led initiatives to promote digital ticketing adoption at scale.

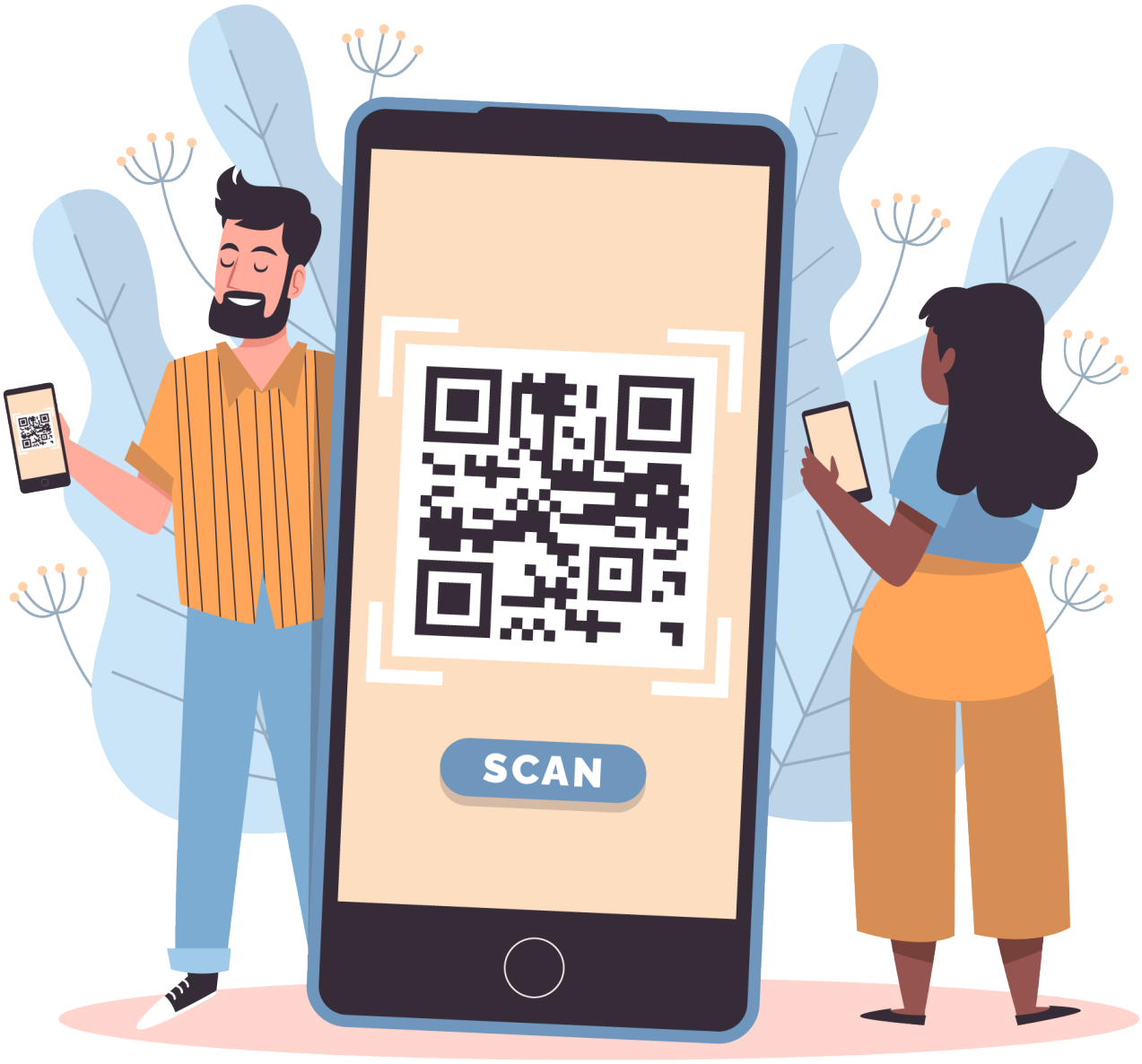
- **Digital infrastructure and system design:** Emphasis was placed on building a future-ready digital ecosystem that is interoperable, secure and adaptable. Participants discussed back-end integration of payment systems, development of a unified mobility platform and ensuring system scalability to accommodate evolving transit needs. The alignment of ticketing technologies across Gujarat Metro Rail Corporation (GMRC) and SSL was seen as crucial for system-wide efficiency.

- **Accessibility and user experience:** To ensure wide-scale adoption, participants recommended simplifying the card acquisition process by making them easily accessible through retail outlets, metro stations and online platforms. The importance of a commuter-

centric design was stressed, including features such as real-time updates, fare transparency and intuitive mobile applications to improve navigation, trip planning and passenger trust.

- **Data-driven operations:** Stakeholders acknowledged the immense potential of digital ticketing data for optimising public transport services. It was recommended that transit agencies use ridership and route data to refine scheduling, manage fleet deployment and enhance operational efficiency, particularly as the city expands its electric bus network.
- **Awareness and adoption strategies:** Finally, the discussions called for the development of creative outreach and marketing strategies to raise awareness about digital ticketing benefits, particularly among underserved groups. Behaviour change communication, along with incentives for early adopters, was seen as essential to build momentum.

Together, these themes form the foundation for Surat's transition toward an integrated, efficient and commuter-friendly urban transport ecosystem.



10

Conclusion and Way Forward

10.1 Conclusion

The Integrated Single Ticketing Workshop in Surat marked a significant step toward reimagining the city's public transport landscape as seamless, efficient and user-focused. Over the two days, the dialogue between national and international experts, city-level transport agencies and implementing authorities fostered a shared vision for an integrated mobility ecosystem. The workshop not only built awareness about global best practices but also catalysed inter-agency collaboration and laid the groundwork for contextualising advanced digital ticketing solutions within Surat's local realities. With unified ticketing as the core enabler, the city now stands at the threshold of transforming public transport into a truly accessible and attractive alternative to private vehicles—paving the way for a more sustainable, inclusive and resilient urban future.

10.2 Recommendations

To operationalise a successful integrated single ticketing system in Surat, the following key recommendations emerged:

I. **Integrated single ticketing system implementation:** Prioritise the development and adoption of a unified digital single ticketing system that integrates buses, metro services and feeder routes. Drawing inspiration from global best practices such as Hong Kong's Octopus Card and London's Oyster Card, Surat should create a system that simplifies fare collection and enhances the commuter experience.

II. **Policy and regulatory framework:** Streamline approval processes for digital ticketing solutions and create robust regulations that support data security and privacy. The city should work with relevant government bodies to create a policy framework that facilitates infrastructure development and encourages rapid adoption of integrated payment systems.

III. **Enhanced accessibility and adoption:** Expand the availability of Surat Money Cards and NCMC at retail outlets, kiosks and mobile apps. Simplify the card acquisition process to ensure wider adoption among citizens, particularly targeting under-served areas.

IV. **Innovative business models:** Develop business models that focus on high-utilisation sectors like commercial vehicles, ride-sharing services and delivery vehicles, encouraging them to adopt integrated single ticketing systems. Incentives should be provided to these sectors to drive their participation in the digital payment ecosystem.

V. **Infrastructure and system compatibility:** Upgrade the existing fare collection infrastructure to be compatible with new technologies and standards. Ensure that the integrated single ticketing system can seamlessly connect with existing and upcoming transport services, including the metro and electric buses.

VI. **Data-Driven operational optimisation:** Leverage data collected through the ticketing system to optimise public transport operations. This includes adjusting bus frequencies, improving route planning and deploying resources more efficiently based on commuter behaviour.

VII. **Public awareness and education:** Launch an awareness campaign to educate the public about the benefits and usage of the integrated single ticketing system. This should include

both digital and offline channels to reach a broad audience, particularly in underserved communities.

VIII. **Collaboration with technology partners:** Engage with technology firms, payment platforms and service providers to ensure that the system meets the latest standards for security, scalability and user experience. A collaborative approach will help maintain the system's long-term viability and user satisfaction.

IX. **Enforcement of fare evasion policies:** Implement strict enforcement mechanisms to curb fare evasion and ensure that the public transport system remains financially sustainable. Regular audits and monitoring should be conducted to maintain transparency and accountability.

X. **Multistakeholder engagement:** Ensure ongoing collaboration with stakeholders, including commuters, transport agencies, city authorities and private sector partners. Continuous dialogue will help address challenges, refine systems and ensure the system evolves according to user needs.

10.3 Road ahead

Surat Municipal Corporation, Sitilink and Gujarat Metro Rail Corporation showed interest in integrating the city's bus and metro ticketing systems through a unified, digital platform. Moving forward, the focus will be on institutional alignment, phased implementation of integrated single ticketing and onboarding of service providers and vendors to implement integrated single ticketing. The insights and recommendations from the workshop were pivotal to Surat's broader urban mobility strategy, ensuring that the public transport system evolves in a seamless, data-driven and commuter-first manner. With continued support from GIZ and proactive leadership by city authorities, Surat is well-positioned to emerge as a national frontrunner in multimodal integrated transport solutions.

The Ministry of Heavy Industries (MHI), Government of India and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH are jointly implementing the Indo-German Development Cooperation project “Promotion of transformation to sustainable and climate-friendly E-mobility”, commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). As part of the Green Urban Mobility Partnership (GUMP) between India and Germany, the project aims to improve the conditions for coupling the transport and energy sectors for climate-friendly electric mobility and achieve sustainable, socially balanced, and inclusive urbanisation (SDG 11). The project works with Surat (Gujarat) to promote systematic, safe, and sustainable adoption of electric mobility solutions to reduce the emission intensity of the transport sector.