CASE STUDY

Contactless Payments Travel Well in London

MasterCard's pay-as-you-go solution provides time-saving convenience for transit riders, operational efficiencies for transit system

Overview

Each day, around 15 million journeys take place on the trains, buses and Underground networks of London. Transport for London (TfL) runs the public transportation network for one of the world's busiest cities. TfL manages the varied systems that move Londoners—and millions of visitors—safely and efficiently to their destinations.

Transport for London

For more than a decade, TfL has used Oyster, a pre-loaded contactless smartcard, as its ticketless payment system for fares on bus, Tube, tram, DLR, London Overground, TfL Rail, Emirates Air Line and most National Rail services in London. Doing so has eliminated the need to use cash to pay for fares, helping to reduce long queues during peak travel times. Over time, however, rapidly changing technology, and a wider desire for more accessible and connected system signaled an upgrade was in order.

Challenge

For daily commuters, the Oyster smart ticketing system is easy and convenient to use. Commuters can pre-purchase a weekly, annual or monthly pass in stations, retail outlets and—for UK residents only—online. The passes mean commuters can travel within the specified area for the relevant period without the need to re-load their cards. Plus, they can pay as they go, with the option to authorise automatic replenishment when their credit balance approaches zero.

But for the nearly 19 million international individuals[1] who visit London each year, as well as residents who infrequently use the transit system, the Oyster card system could be problematic. Unlike regular Oyster card users, visitors first had to become educated on the system, and then purchase—and adequately fund—an Oyster card for their transit needs in London.

> "We wanted to give people the independence to pay for transit in exactly the same way they pay for everything else...with the product that's already sitting in their pocket."
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> **SHASHI VERMA**
> Director of Customer Experience
> Transport for London

Consider this typical scenario:

> An international visitor arrives at London's Heathrow Airport, and decides to take the Tube to Piccadilly Circus station in Central London. First, though, the tourist must acquire a card at the airport's Visitor Information Centre or from an Oyster card machine in the Tube station. If unfamiliar with Oyster, this process could cause significant—and frustrating—delays.

As well as being inconvenient for international visitors, Oyster had two further problematic features. First, it imposed significant operating costs on TfL. Volumes of new Oyster card issuance are in excess of 500,000 cards per month which resulted in a hefty bill for purchasing, preparing and distributing new cards, as well as substantial costs to maintain top-up kiosks and collect cash from stations. Second, the requirements for the Oyster system were finalised, before the internet became widely adopted; hence, it did not have a straightforward way for customers to manage products stored on Oyster cards online which had to be retrofitted into the system.

1. MasterCard Global Destinations Cities Index, 2015

Solution

TfL was eager to implement a new method for administering its ticketing system without having to make another sizeable capital investment. After extensively researching alternatives that would accommodate advancements in digital technologies TfL set several goals and identified key criteria used in considering proposals for a new or upgraded system:

Cost

Cut the cost of collecting fares, with a target of reducing them to

6%
OF REVENUES

Speed

LIMIT THE TRANSACTION TIME at Oyster readers to a maximum of

500
MILLISECONDS—the time it takes to walk through a ticket gate without breaking stride

Global Interoperability

Find a solution that could **SEAMLESSLY OPERATE WITH**

EXISTING
PAYMENT TECHNOLOGIES, in the UK and around the world

After examining a number of technologies, TfL selected MasterCard's contactless payment technology to be the enabler for the innovative enhancement of the Oyster system under the Future Ticketing Programme. Both TfL's own technology team and the Oyster system provider Cubic Transportation Systems were tasked with designing and implementing a system upgrade. This enhancement would eliminate both the need for occasional or one-time travellers to acquire Oyster cards as well as the middlemen required to sell and administer them.

The foundation for the solution was MasterCard's contactless payment technology which allows everyday purchases to be made quickly and safely with just a touch of a contactless-enabled MasterCard® or Maestro® card, NFC-enabled smart phone or other contactless device. The core concept of the programme was to enhance the Oyster system infrastructure to make it capable of interacting securely with contactless payments cards, and perform the complex logic of fare calculation and daily capping in a back-office system that would also allow proper online account management.

With this solution, there is no need for a PIN or a signature; customers simply touch their card or device on TfL's signature yellow readers to enter the system, and then tap again when exiting. Customers using contactless payments lose none of the benefits associated with Oyster card usage, such as automatically calculating the best value for their contactless travel in a day or over a seven-day Monday-to-Sunday period.

The solution makes optimal use of three specific MasterCard technologies and/or rules in its design:

Offline Data Authentication

The enhanced Oyster terminals can complete secure cryptographic EMV authentication for each transaction made by card or mobile device entirely offline without exchanging keys or data with remote servers. As such, the system is highly resilient against counterfeit attempts while maintaining the transaction speed necessary to allow high volumes of passengers to move through the transport system at peak hours.

Zero-Value Terminals

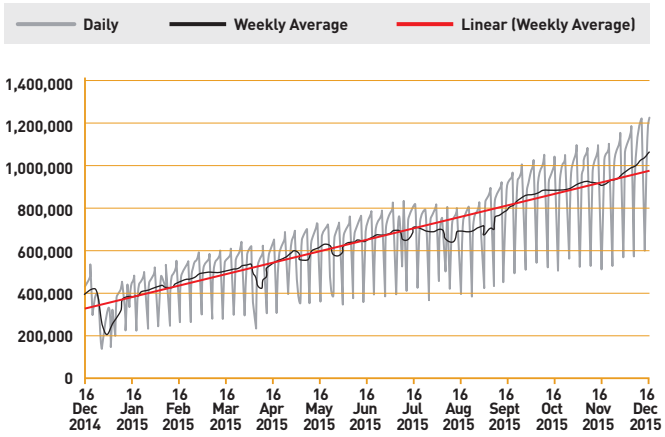
Most contactless payment situations may require the customer to enter a PIN for cardholder verification. In a busy, peak transport environment, process would slow down fare transactions, creating a frustrating situation for both TfL operators and customers. For optimum efficiency and passenger satisfaction, MasterCard recommended that Cubic hard-code the Oyster terminal software to remove the PIN entry requirement.

Fare Aggregation

MasterCard recognises that most transport providers charge fares based on the distance the customer travels. For each journey, a cardholder must tap in to the transport system, travel between stations, and then tap out, only charging a fare after the second tap. To reflect this, MasterCard introduced an aggregation rule enabling TfL to offer daily and weekly capping, and charge each payment card on a daily cycle once these caps have been applied. More generally, the rule gives transport providers the flexibility to offer a range of other fare constructs such as free transfers and time-based tickets.

Results

Daily Journeys Using Contactless in London[2]



On average, about **7.7 million journeys each week are made using contactless payments**, accounting for almost 30 percent of trips on the Tube and commuter rail systems and around 25 percent on buses—with usage steadily rising each month.

Contactless payment has been an unqualified success for TfL, as consumers have eagerly embraced the technology. Since its launch in September 2014,[3] more than 372 million journeys have made, and 10.7 million unique contactless cards or payment devices have been used. Now, TfL regularly sees more than 1 million journeys per day using contactless payment cards, with about 25,000 new contactless cards in use each day.[4]

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Customers are now also using other methods of payment, such as mobile device ticketing technology. Since July 2015, more than 3.2 million journeys have been made using mobile devices within the TfL network, accounting for around 3.5 percent of all contactless journeys. This number is adding an average of 7,000 extra devices making TfL transactions each week.[4]

Benefits at a Glance

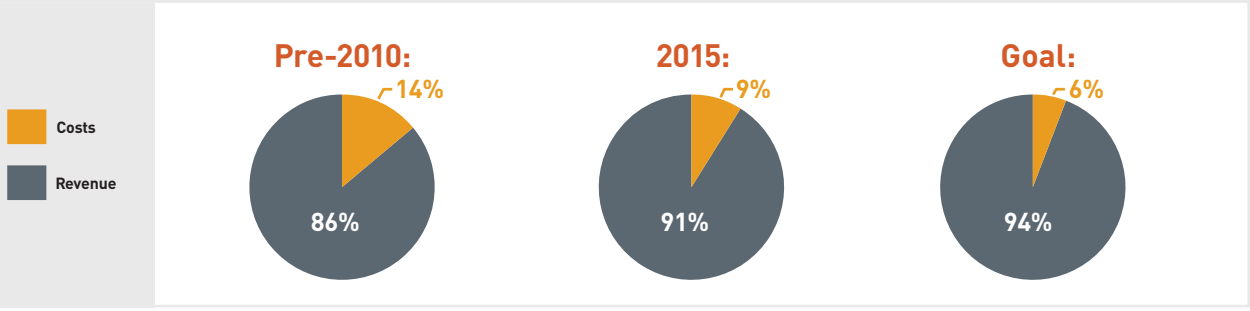
Consumers—be they London residents or visitors—indicate they prefer contactless payment because of its convenience. The most time-consuming and frustrating aspects of TfL transit have been eliminated, especially the need to pre-register or pre-purchase a "special" transit card before travel. Simply using their existing payment cards or mobile payment solutions has simplified each TfL journey.

For **London**, contactless has generated a reputational boost. The convenience and simplicity of the system have encouraged more individuals to use TfL rather than other travel options, while raising user satisfaction scores in the process.

Finally, **issuing banks** are reaping the benefits of simple, easy and convenient contactless payments, too. Everyday transit transactions are increasing card usage and loyalty—and generating the same sort of reputational boost the city of London also enjoys.

2. Transport for London, Commissioner's Report, 03 February 2016, page 32
3. http://newsroom.mastercard.com/press-releases/tfl-leads-way-contactless-payments-launch-london-transport/
4. https://tfl.gov.uk/info-for/media/press-releases/2016/january/more-than-a-quarter-of-london-pay-as-you-go-customers-now-travel-using-contactless-payments
5. Transport for London, Commissioner's Report, 03 February 2016, page 32
6. Transport for London, Commissioner's Report, 03 February 2016, page 34

In just over a year, the cost of collecting fares has dropped from about 14 percent of revenues to just below 9 percent, with expectations that it will reduce further to around 6 percent—resulting in massive cost savings.[6]



Qualitative surveys conducted for TfL illustrate the widespread popularity of contactless payments among transit users. Across all demographic groups, the primary benefits of contactless are the same—it saves time, saves money, is easy to use and eliminates the need to repeatedly load money onto another card.

Those benefits are quite apparent from the first usage survey. The TfL survey found that 2/3 of users converted to contactless as their preferred method of payment after just one trial use, and another 16 percent did so within a month. Further, nearly 2/3 of users review past journeys and payment histories through the online portal, a functionality that enables TfL to offer a compelling online customer experience to contactless payment users and was not available before the conversion.

Importantly, the interoperable solution provided by Cubic using MasterCard technologies enabled TfL to tap into a global customer base—which is underlined by the fact that to date, visitors from more than 80 nations have used contactless payments on London buses and trains.

Contactless has achieved hoped-for operational efficiencies as well. For instance, despite a 4 to 5 percent increase in Tube journeys since contactless was instituted, the system is experiencing a 10 percent drop in Oyster card purchases at Tube stations.[7]

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Conclusion

Contactless payments are working smoothly in London, making TfL a best-in-class programme for contactless enablement in a transit system.

Building off the London work, MasterCard now has global rules and procedures for contactless transit payment systems, which will enable future implementations to take place swiftly and efficiently.

7. **Transport for London, Commissioner's Report, 03 February 2016, page 34**

MasterCard is committed to helping cities become more inclusive, more sustainable and more open—by applying our technology, data and partnerships to the challenges of an increasingly urban world. **For more information about our work with cities around the world, visit: www.mastercard.com/smart-cities**