Tourism & Transport Forum (TTF)

Position Paper

Smartcard ticketing on public transport

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Tourism & Transport Forum (TTF) is a national, Member-funded CEO forum, advocating the public policy interests of the 200 most prestigious corporations and institutions in the Australian tourism, transport, aviation & investment sectors.

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In short:

1. Smartcard ticketing provides convenience for commuters and efficiency gains for transport service providers.
2. Smartcard systems have been introduced in Australian cities with varying degrees of success.
3. International experience suggests that successful implementation may take many years, and difficulties are commonplace.
4. Overall, the benefits of smartcard ticketing overwhelmingly outweigh the costs and challenges that may arise in implementation.

Overview

Smartcard technology is being implemented around the world as a substitute for cash transactions in various capacities. When applied to public transport fare collection, smartcards eliminate the need for commuters to queue for tickets and reduce the burden on transport providers to process fare transactions.

In recent years, benefits such as decreased travel times and general convenience to commuters have driven a shift towards smartcard ticketing systems on public transport systems in Australia and around the world.

As well as providing more efficient transport services to commuters, smartcard ticketing systems enable service providers and transit authorities to collect comprehensive data on the travel behaviour of commuters. With this information at hand service providers are able to cater to the needs of commuters, and allocate resources more efficiently.

In spite of these benefits, experience has shown smartcard ticketing systems are prone to early implementation problems, as commuters adapt to the new technology, and it is tailored to meet the needs of unique transport systems. While it is widely regarded as a best practice smartcard operation, London's Oyster Card has also experienced such difficulties, and its success is mostly attributable to the long term perseverance of transport authorities in recognition of the broader benefits it can provide.

These issues notwithstanding, TTF believes that the benefits of smartcard ticketing for transport operators and commuters far outweigh the costs of the potential challenges that may arise.

Smartcard technology

The smartcard is the technological successor to the magnetic stripe card. Smartcards are typically the size of a credit card, and contain a microchip that stores and transmits data using radio frequency identification (RFID), enabling it to communicate with a device within ten centimetres of the card without physical contact. Smartcards are able to store enough information to process monetary transactions and profile a card holder's details for security purposes.

Smartcard technology is being used increasingly to perform the functions of credit cards, security passes and, as this paper examines in detail, public transport tickets. Smartcard ticketing is well established as the standard best practice in public transport ticketing, and its emergence is indicative of a broader transition towards a cashless global economy.

There are two categories of smartcards that can be used for public transport ticketing – a single purpose transit pass and an electronic purse (e-purse) card with multiple applications beyond fare payment, such as small retail transactions and personal identification. Both involve a prepaid account managed by the card holder.

Recent innovations in smartcard technology have concentrated on developing e-purse applications to enhance the appeal and accessibility of smartcard ticketing to infrequent commuters or tourists. These are discussed in more detail later in the paper.

Advantages of smartcard ticketing

Convenience for commuters

Smartcard ticketing systems enable commuters to carry one durable card for use on all transit modes. A single multi purpose ticket makes using multiple transport modes much simpler and less time consuming. In turn, this facilitates the multimodal travel behaviour that is encouraged by operators and transport planners. In this regard, smartcard ticketing facilitates a genuinely seamless multimodal transport system.

Options to automatically top up a prepaid account via direct debit or credit payment – similar to e-tolling systems for toll roads – allow commuters to pay fares without ever having to make face-to-face transactions. This reduces the time spent commuting as card holders are able to top up their account balance at a time that is most convenient to them. Consequently, the possibility of missing a public transport service whilst queuing for a ticket is eliminated.

'Pay as you go' (PAYG) features also ensure that commuters get exactly what they pay for, as the card is swiped at the start and end of every journey. Typically, commuters are guaranteed the lowest possible fares when using a smartcard, which provides a considerable financial incentive for commuters to take up smartcards and to use them properly.

With less need to carry cash, commuters using smartcards can also enjoy greater personal security. In the event of a card being lost or stolen, accounts can be cancelled and a new card issued, as would be the case with a bank card or credit card. By the same measure, cashless transactions benefit transport agencies, as the security risk to drivers and other cash handling employees is significantly reduced.

Increased service efficiency

A typical smartcard transaction takes just 150 milliseconds to complete,[1] and with drivers and other public transport employees no longer required to collect money and issue tickets, smartcard ticketing systems deliver significant savings in boarding times. For example, in London, as a result of 98 per cent of bus commuters now using Oyster Cards, boarding rates have increased from 10 to 40 passengers per minute, substantially cutting trip times.[2]

"A *go* card can cut a passenger's boarding time from about 11 seconds to three and that translates to a time saving of up to seven minutes on an average bus service." Queensland Transport Minister Rachel Nolan 23/12/2009

The reduced boarding times for commuters frees up capacity for operators to increase service frequency, enhancing the utility of transport assets – both rolling stock and road and rail infrastructure. Service providers also stand to save considerably on operating costs associated with fare collection and issuing tickets.

Service efficiency is also enhanced by savings in the cost of maintaining smartcard systems, relative to its technological predecessor. On average, magnetic stripe card readers require servicing after every 20,000 cards processed, which could be as frequent as once a week for busier terminals. With complex mechanical parts required to process and often print onto cards, the maintenance ratio[3] of this older technology is around 12 to 15 per cent, compared with just eight per cent for smartcard technology.[4] Moreover, the one-off cost of distributing durable plastic cards is soon offset by the savings (both economic and environmental) in the cost associated with printing and issuing disposable paper or cardboard tickets.

Travel data collection

Traditionally, the data used to inform transport policy and the planning of service provision has been gathered from sources such as annual travel surveys or ABS data developed from the census, conducted every five years. Census data encompasses most of the population, but only covers journeys to work on a five-yearly basis. Annual travel surveys are more specific, but are taken from a very limited sample. For example, the annual household travel survey conducted by Transport NSW samples approximately 8,500 people in 3,500 households.[5] While this information is useful to an extent, it incurs a significant information lag.

Smartcard technology is capable of storing and transmitting much more information than the magnetic stripe card, opening up new possibilities for transport agencies to collect precise data on the travel patterns of individuals. This enables better planning for the entire network. Even a small percentage of smartcard use can yield superior data for transport operators than the limited sample and scope of the traditional data sources outlined above. For example, in Perth approximately 70 per cent of commuters use the SmartRider ticketing system[6] allowing transport agencies to map key performance indicators, patronage, and travel patterns with

[1] Global Mass Transit Report: Contactless Smart Ticketing: A win-win deal for all stakeholders, November 1 2009. Retrieved 4/5/2010 from: http://www.globalmasstransit.net/archive.php?id=1291
[2] The Financial Review, 1/4/2010: *An Oyster may be just the ticket for public transport.*
[3] Percentage of total annual capital investment cost required for maintenance.
[4] International Association of Public Transport (UITP), Core Brief: *Contactless Ticketing*, March 2001. Retrieved 7/4/2010 from: www.uitp.org/mos/corebrief/CBrief%20-Billeterie-en.pdf
[5] Transport NSW*: Household Travel Survey Data.* Retrieved 4/5/2010 from: http://www.transport.nsw.gov.au/tdc/house-survey.html
[6] Public Transport Authority of Western Australia: Annual Report 2008-2009, p20.

greater accuracy than their counterparts in Sydney were travel data is gathered ad hoc by each operator or through the Household Travel Survey.

Through the analysis of this information, transport agencies are able to respond more effectively to fluctuations in demand at different times in different areas. The task of planning public transport services is therefore simplified and subsequently, the integration of services – particularly at modal interchanges – gives rise to a more efficient network. The ability to plan service provision around such comprehensive travel data is one of the most empowering benefits of smartcard ticketing for transport agencies, as it enables them to tailor services to the specific needs of different markets.

Demand Management

Governments predominantly aim to promote public transport patronage by investing in the supply of new infrastructure and rolling stock. Implementing smartcard ticketing, on the other hand, presents an opportunity for governments to significantly influence the demand for public transport. With access to comprehensive travel data on the demand side, transport operators are able to develop and improve ticketing as a consumer product. This may include offering discounts on travel to and from certain areas at various times to stimulate the spread of demand across a network, maximising its revenue earning potential and encouraging increased patronage in off peak periods.

Individuals can also be offered discounts as an incentive for frequent travel, encouraging more people to use public transport and rewarding sustainable transport choices. For example, South East Queensland's *go* card offers a 50 per cent discount for commuters who use their card more than ten times in a week, and a 10 per cent discount for use in off peak periods. Airlines and petrol retailers are well ahead of public transport providers in the area of customer loyalty incentive schemes, and provide examples of the potential for such schemes to drive demand for a particular product – in this case, public transport.

Deterring fare evasion

Recorded data on travel patterns and card use also means authorities are better equipped to detect and deter fare evasion. Data that reveals each instance in which a smartcard is registered at a fare collection point can be used to identify individuals with patterns of use that suggest deliberate and sustained fare evasion. With the requirement for smartcard holders to register their personal details, the task of prosecuting serial fare evaders is made considerably easier. Similarly, the dispatch of transit inspectors can be targeted at areas with higher incidence of illegal or irregular card use, thus allowing for more efficient use of resources in this area.

Expanding the use of smartcard payments

Further to the successful implementation of smartcard payments for public transport fares, and as part of a broader movement towards a cashless economy, the use of smartcards can be extended to other areas of the transport market such as car parking. As well as incorporating metered parking, Perth's SmartRider system is used as an exclusive payment method for selected park and ride facilities. Expanding the use of smartcards in this fashion ensures these facilities are used for their intended purpose, hence encouraging more people to use public transport instead of private vehicles. Hong Kong's Octopus card exemplifies the

extent to which the use of transport smartcards can be expanded to incorporate cashless transactions for taxi fares and even retail purchases.

Challenges for implementation

Commuter behaviour

Smartcard technology demands an element of public compliance to ensure successful implementation. As such, smartcard ticketing systems are is prone to encountering early implementation problems as commuters are required to change their everyday behaviour in order for the system to succeed.

For smartcard technology to work on transit modes such as bus and light rail, commuters must swipe on when boarding, and off when alighting the vehicle. This can cause problems if commuters forget to swipe off, and the potential arises for penalty fares to be issued in cases of genuine human error. Melbourne's Myki system imposes a default fare equal to the maximum fare applicable for the zone in which a service operates[7] when commuters fail to touch off.

Similarly, South East Queensland's *go* card has a standard default fare ($3 for bus/ferry and $5 for rail) across the 23 zones it incorporates, but is typically higher than the average fare on a particular service. As is the case in many smartcard ticketing systems, the monetary incentive of guaranteeing a lower fare for successfully swiping off is the most effective means of encouraging the required behavioural shift.

Alternatively, as shown in London, this challenge can be overcome by charging a flat fare rate to all commuters on particular services, thus requiring them only to swipe on. Nonetheless, to minimise instances of human error, implementation strategies must include comprehensive educational campaigns to ensure that the transaction process is understood and compliance is made as simple as possible.

Technical faults

Just as smartcard systems on some transport modes are prone to problems arising from human error, the technology itself is also susceptible to faults, as is the case with any machinery. Any minor glitch in the software or hardware can cause – in a worst case scenario – a system wide break down, resulting in disrupted services and fares not being collected.

In 2007, it was found that a fault in the Electronic Payment Systems (EPS)[8] top-up service for Hong Kong's Octopus system had affected around 15,270 transactions dating back seven years, costing commuters more than HK$3.7 million. An independent report conducted by PricewaterhouseCoopers found that only about 0.06 per cent of EPS transactions between 2000 and 2007 had been affected, however full refunds were issued, and EPS top-up services were discontinued due to the inability to guarantee similar occurrences in the future.[9]

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[7] Myki default fares as at 14/4/2010 indicate that a full fare customer who fails to repeatedly touch off and travels across zone 1&2 will never pay more than $9.92 on a weekday or $3.00 on a weekend or a public holiday.

[8] EPS is a transaction service in Hong Kong that is comparable to EFTPOS.

[9] Octopus Cards Limited, press release, 27/7/2007: *Independent Review of Failed Octopus EPS Add-Value Transactions Completed, Octopus to Carry Out Immediate Return of Past Unclaimed Funds.*

As this example shows, teething problems in implementing smartcard systems can occur, and are often impossible to prevent as each new system involves unique engineering and software development.

Security and privacy

While the ability to track travel behaviour will enable transport providers to optimise services, there are some concerns over intrusions to the privacy of citizens. In almost every jurisdiction where smartcard ticketing has been implemented, police and intelligence agencies are able to access travel information on smartcards for the investigation or prevention of crime. In the UK, police make over 3,000 requests per year for travel information from Transport for London.[10]

Whether this is beneficial or intrusive is a matter of opinion. The potential for improving the detection and investigation of criminal activity invariably involves a trade-off in the privacy of citizens, and has long been the subject of concerns raised in the Australian and British media.

Complexity of transport networks

A common problem in the implementation of integrated smartcard ticketing systems arises from the need to encompass every fare rate possible for every service provider across an entire network. One of the reasons for the failure of Sydney's T-Card system was the requirement for it to incorporate over 500 fare types on all modes.

While rationalising fare structures may simplify the implementation of smartcard systems, international experience shows that it is not absolutely necessary, and fare structure has certainly not proven to be the stumbling block elsewhere as it was in Sydney. For example, the functionality provided by Seoul's T-Money smartcard allowed transport operators to phase out zonal fares and reintroduce distance based fares. Furthermore, the PAYG function of the London Oyster card incorporates up to 5 million different automatic fare calculations.[11]

The logistic and geographic characteristics of particular transport networks can hinder the roll out of smartcard ticketing. In Melbourne, problems have been encountered maintaining remote communication with Myki facilities on city trams, which have been attributed to tall city buildings and the heavy steel construction of the trams themselves.[12] Similarly, the geographical size of the TransLink network in South East Queensland – one of the largest in the world – also presents unique challenges to the network of 500 retailers relied upon to manage the distribution of *go* cards for use across an area of 10,000 square kilometres.

Every network has a range of unique characteristics, and as such there is no "off the shelf" system that can easily be transferred from one network to another. The reality for established, older public transport networks – such as those in Sydney and Melbourne – is that adopting new ticketing technology, in spite of the significant benefits it may bring, is likely to encounter teething problems as new software and hardware must be developed to meet the needs of each city's transport network.

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[10] The Age, 19/11/2009: Myki tracking device warning. Retrieved 30/3/2010 from: http://www.theage.com.au/national/myki-tracking-device-warning-20091118-imlj.html

[11] Transport for London, press release, 23/11/2009: One ticket for London as Oysterisation of rail and river confirmed. Retrieved 16/6/2010 from: http://www.tfl.gov.uk/corporate/media/newscentre/archive/13688.aspx

[12] The Age, 9/11/2010: *Still smarting*, Retrieved 31/3/2010 from: http://www.theage.com.au/national/still-smarting-20091106-i0ew.html

Smartcard ticketing in Australia

	Launch	Contractor	Cost	Compatible modes	Take-up
Western Australia: SmartRider 	April 2007	Downer EDI Limited	$35m	Train, bus, ferry and metered parking in Perth. Bus services in Geraldton and Busselton.	230,800 cards in use. 71% of all public transport trips.
Queensland: *go* card 	January 2008	Cubic Corporation	$200m for a minimum 10 year period	TransLink train, bus and ferry services and Brisbane Airport Airtrain.	750,000 cards in use. 60% of all public transport trips.
Victoria: Myki 	December 2008	Kamco	$1.3b over ten years	Metropolitan trains and regional buses. Complete state-wide roll out on all modes expected in late 2010.	-
Tasmania: Greencard 	September 2009	INIT (design only)	$6m	Bus	-
ACT: MyWay 	Late 2010 (expected)	Downer EDI Limited	$8m	Bus	-
New South Wales 	2012 (expected)	Pearl Consortium (Cubic, Downer EDI, C'wealth Bank)	$1.2b over fifteen years	All NSW trains, buses and ferries covered by the MyZone fare structure.	-
South Australia 	2013 (expected)	Affiliated Computer Services (ACS)	$30m	Adelaide buses, trains and trams.	-

Western Australia: SmartRider

Introduced to the public in April 2007, Transperth's SmartRider was Australia's first smartcard ticketing system. SmartRider is used to pay for train, bus, ferry and metered parking in Perth, as well as bus services in the regional centres of Geraldton and Busselton. Transperth oversees the operation of SmartRider, which was implemented by Downer EDI Limited, at a cost of $35 million. In 2010 there are more than 230,800 SmartRider cards in circulation which are used to pay for approximately 71 per cent of all public transport trips on Transperth services.

Queensland: go card

Used on South East Queensland's public transport network, the *go* card was launched in January 2008. The *go* card was delivered by the Cubic Corporation, under a contract with the Queensland Government worth approximately $200 million over a minimum 10-year period. It can be used across all TransLink network train, bus and ferry services as well as the privately owned Airtrain to Brisbane Airport. The roll out of *go* cards was carried out in regional stages over a five month period with discounted fares of 20 to 25 per cent offered from August 2008. In January 2010, the *go* card fare became the base fare for calculating all other fares across the TransLink network – *go* card fares were set at 2007 levels, making them 30 per cent cheaper than paper ticket fares. This boosted *go* card use from 30 to 60 per cent between January and March 2010. In addition 400,000 free *go* cards, loaded with $10 credit will be distributed in 2010, which is expected to further increase the use of *go* card, as the Queensland Government aims to phase out paper ticketing in the near future.

Victoria: Myki

In June 2003, the Victorian government established the Transport Ticketing Authority to procure and manage a new integrated smartcard ticket to replace the Metcard and V/Line systems in metropolitan Melbourne and regional Victoria. In July 2005 a ten year $494 million contract was awarded to Kamco to deliver Myki which was gradually introduced to regional and suburban bus services from December 2008, following a lengthy trial period. From December 2009, Myki was rolled out across metropolitan train services, and trials on Melbourne's trams and buses are ongoing. A series of teething problems attributable mainly to the unique logistical challenges of Melbourne's transport network posed additional costs – now estimated at $1.3 billion over the term of the contract – and delayed the complete roll out of Myki on all tram and bus services. Myki will be the first smartcard ticketing system in Australia to cover all public transport modes across an entire state.

Tasmania: Greencard

Tasmania's Greencard was launched in September 2009, and was designed by German firm INIT. As the Metro network comprises only 221 buses, the roll out of smartcard technology in Tasmania was relatively simple, costing approximately $6 million.[13] One of the keys to its success has been the Greencard system's ability to charge correct fares without requiring patrons to swipe off at their destination, a feature that is enabled by a small network with a simple fare structure.

[13] The Age, 9/11/2009: *Still smarting*. Retrieved 31/3/2010 from: http://www.theage.com.au/national/still-smarting-20091106-i0ew.html

ACT: MyWay

The ACT government aims to have smartcard ticketing system rolled out on Canberra's bus network by the end of 2010, with trials to begin in August. The $8 million MyWay system will be modelled on Perth's SmartRider system and will also be implemented by Downer EDI Limited.[14] Like Tasmania's Greencard, the simplicity and single mode (bus) of the ACT's transport network makes the roll out of smartcard ticketing in the ACT relatively simple and considerably cheaper than may be the case in larger cities with multiple modes in operation.

New South Wales

The NSW government announced plans to create what was to be Australia's first smartcard ticketing system in 1996, with the T-Card system planned to be fully operational by the 2000 Olympics. A dispute arising from the tendering process delayed the development of the system until 2002, and a series of problems during the development and trial stages culminated in the termination of the contract between the NSW government and contractor ERG in January 2008. The failed project has cost the government approximately $100 million[15] which could be more, pending the outcome of legal proceedings that continue to this day.

Following the abandonment of the T-Card system, the NSW government has recommitted to smartcard ticketing, with a new procurement contract worth $1.2 billion over fifteen years awarded to the Pearl Consortium consisting of Cubic Corporation, Downer EDI and the Commonwealth Bank. The establishment of Transport NSW and the MyZone fare rationalisation provides the necessary conditions for the fully integrated smartcard ticketing to be implemented successfully. The roll out of the new system is expected to commence in 2012.

South Australia

In February 2010, The South Australian government issued a $30 million contract to Affiliated Computer Services (ACS) to supply its ATLAS smartcard ticketing system for use on Adelaide's buses, trains and trams.[16] ACS is the current operator of Adelaide's Crouzet automated ticketing system, and has experience operating the ATLAS smartcard system in cities such as Montreal, Houston and Toulouse.[17] The system will be in place in 2013, coinciding with the completion of rail upgrade projects that are currently underway.

Smartcard ticketing internationally

Hong Kong: Octopus

The Octopus card is used by 95 per cent of people in Hong Kong aged between 16 and 65[18] and is regarded as one of the world's most successful and advanced smartcard systems for use in mass transit. In addition to fare payments for bus, taxi, subway, train, tram, and ferry services in Hong Kong, Octopus has been expanded

[14] ACT Government Media Release: *Roll-out of ACTION's Smartcard technology begins,* 28/4/2010.
[15] NSW Parliament, Hansard transcript: 30/3/2010, 5:04pm.
[16] Government of South Australia, News release, 8/2/2010: *Smartcard - The next big ticket item for public transport.*
[17] Ibid.
[18] Octopus Corporate Profile: Services in Hong Kong. Retrieved 7/4/2010 from: http://www.octopus.com.hk/about-us/corporate-profile/services-in-hong-kong/en/index.html

for use on small-value payments in the retail sector, access control for residential and commercial buildings and support for various facilities in schools.[19] Every day, more than $HK100 million worth of transactions are made using Octopus cards, and around 2.3 million people have registered for the Octopus rewards scheme,[20] which is similar to retail reward schemes such as Flybuys, but built into the one card. Octopus Cards Limited has also integrated compatible smart chips into watches, key rings and mobile phone covers.

Chicago: Chicago Card

The Chicago Transit Authority (CTA) launched the Chicago Card system in 2002. The system is operated by Cubic Corporation, which also installed and operated the city's predecessor magnetic stripe ticketing system. CTA issues both stored-value and account based cards. In July 2006, increases in cash fares prompted a surge in demand for the cards, over 700,000 of which are currently in circulation. CTA has announced plans to phase out the Chicago Card in the near future, with fare payments to be made with contactless credit cards, debit cards and prepaid cards issued by banks and other external financial service providers. The transition to next generation fare payments is set to commence in mid 2010.[21]

Singapore: EZ-Link

The Singapore Land Transport Authority (LTA) launched the EZ-Link smartcard system in 2002, and has issued 10 million EZ-Link cards since. Every day approximately 8 million transactions are made on the system,[22] primarily for public transport fares. An important characteristic of the EZ-Link card is that, since 2008, it has been designed under a unique standard for contactless payment technology in Singapore, in accordance with a conscious transition towards a cashless society. Consequently, the cards are thicker and more durable which allows them to perform additional functions such as e-tolling for private cars.[23]

Case study: London's Oyster Card

London's Oyster card was first issued to the public in July 2003, following trials and product development dating back to 1998. At first, Oyster had limited features and functions but this has gradually expanded and continues to do so. By 2010, an estimated 28 million Oysters had been distributed, with around seven million cards in regular use to pay for more than 80 per cent of daily trips on Transport for London (TfL) services. In 2009, more than three billion passenger journeys were paid for using Oyster cards.[24]

Oyster is valid to use on all public transport modes across London including London Underground, buses, the Docklands Light Railway (DLR), London Overground, trams, Thames River ferries and most National Rail services within London fare zones.

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[19] Ibid.
[20] Ibid.
[21] Chicago Transit Authority, 8/12/2009: CTA Outlines Next Generation Fare Collection Project. Retrieved 19/5/2010 from: http://www.transitchicago.com/news/default.aspx?ArticleId=2431
[22] EZ-Link Corporate Information: Company Profile. Retrieved 9/6/2010 from: http://www.ezlink.com.sg/corporate/corp_companyprofile.jsp
[23] Ibid.
[24] Transport for London, 23/11/2009: *One ticket for London as Oysterisation of rail and river confirmed,* media briefing note. Retrieved 7/4/2010 from: http://www.tfl.gov.uk/corporate/media/newscentre/archive/13688.aspx

While the Oyster card is one of the world's most renowned smartcard ticketing systems, its implementation has been fraught with technical problems[25] and ongoing costs[26] that have posed serious challenges to TfL and TranSys– the consortium responsible for establishing and operating the Oyster system.

In 2008 TfL used a break condition in its contract with Transys and subsequently issued a revised contract to the consortium. Under the new arrangement, TfL gained ownership of the Oyster brand by paying out Transys' financiers, and in the process saved around £4 million in interest payments.[27] The initial contract worth £100 million per year over 17 years was replaced with a three year contract, which is said to deliver considerable public savings in addition to allowing for competition in the tender for future contracts.

Both the renegotiated contract and the existence of a break condition in the original contract represent prudent administration and long term planning on the part of TfL. When the new contract comes into effect in August 2010, the capital-intensive period of implementing Oyster will be largely completed. TfL has indicated that future expansion of the Oyster system will be focussed on developing its interoperability and e-purse applications,[28] involving more private sector innovation rather than heavy investment in new infrastructure.

The success of Oyster should be a source of encouragement for other jurisdictions that are currently implementing smartcard ticketing systems. The complexity and size of the TfL network has required a gradual and strategic approach to the roll out of Oyster over the last seven years, which has not been without controversy or criticism. The perseverance of TfL in implementing Oyster, in spite of these difficulties, is testament to the broader benefits that smartcard ticketing can provide.

Innovation in smartcard technology

As mentioned previously, the emergence of smartcard ticketing is symptomatic of a global trend toward cashless transactions. Driving this shift, major credit card companies such as Visa and MasterCard are embedding smart chips in cards that enable them to perform the functions of a public transport ticket as well as regular functions. This concept has also been extended to mobile phone technology, with the availability of applications for smartphones that enable the phone itself to perform ticketing and card payment functions.

Credit card products

Smart chips are now a standard feature in most new credit cards and in many parts of the world, transport agencies and the financial sector are working on compatible payment media

[25] The Daily Mail, 14/7/2008: Thousands of passengers travel free as Oyster card suffers mass system failure. Retrieved 30/3/2010 from: http://www.dailymail.co.uk/news/article-1034844/Thousands-passengers-travel-free-Oyster-card-suffers-mass-failure.html#ixzz0jcmTISkI
[26] BBC News, 10/3/2005: '£50,000 lost' in Oyster failure. Retrieved 30/3/2010 from: http://news.bbc.co.uk/2/hi/uk_news/england/london/4335291.stm
[27] Transport for London, 12/4/2010: TfL secures ownership and control of Oyster brand and ticketing system. Retrieved 19/4/2010 from: http://www.tfl.gov.uk/corporate/media/newscentre/15260.aspx
[28] Ibid.

to complement and even replace single purpose smartcard tickets. Visa's PayWave and MasterCard's PayPass are already prominent in small retail payments worldwide and have been adapted for public transport use in many cities including Los Angeles, Paris[29] and Rio de Janeiro.[30] PayPass payment systems for taxis have been particularly successful in US cities including Philadelphia, Las Vegas and New York City where approximately 28% of total PayPass use occurs in taxis.[31]

The distribution of these products presents opportunities for banks and other finance sector players to become involved in transport ticketing. For example in the UK, Barclaycard has recently released OnePulse, a Visa credit card which doubles as an Oyster card and offers customers a 5 per cent cash-back incentive for spending on Oyster fares.[32] In Hong Kong, Citibank has developed an Octopus enabled Visa credit card, offering incentives such as zero annual fees.[33]

The development of integrated e-purse payments for public transport fares and small value purchases raises opportunities for new revenue streams for retailers, the financial sector and transport service providers.[34] Employing the payment systems expertise of financial service providers delivers cost savings to all stakeholders, enabling transport agencies to focus more resources on service provision. With the Commonwealth Bank being a partner to the NSW smartcard contract, TTF anticipates the new system and its users will be well placed to take full advantage of these benefits.

Mobile phone applications

The use of mobile phones for public transport ticketing is already prevalent in Japan and South Korea. Phones with inbuilt near field communication (NFC) chips have been available in these markets for some time now which, with supporting applications, are compatible with most smartcard hardware systems. In effect, the phone replaces the card in the contactless transaction and also provides a digital interface from which a user can manage their account.

The use of mobile phones in this capacity will ultimately reduce supply chain costs and increase convenience for commuters. Importantly, this technology brings further private sector expertise and innovation into the transport ticketing market, reducing the burden on transport agencies to issue tickets and manage transactions and accounts. To date, this technology has been most successful in countries (such as Japan) where credit card penetration is relatively low. Ultimately, TTF believes the involvement of the financial and mobile communications sectors in transport ticketing will yield considerable benefits to transport operators and commuters.

[29] Visa Media Centre, 4/11/2008: *Visa to improve payment experience for commuters in Los Angeles and Paris.* Retrieved 7/4/2010 from: http://corporate.visa.com/media-center/press-releases/press871.jsp
[30] MasterCard News Centre, 4/11/2009: *MasterCard PayPass for Public Transportation Arrives in Rio de Janeiro, First in Latin America*. Retrieved 7/4/2010 from: http://www.mastercard.com/us/company/en/newsroom/brazil_paypass_press_release.html
[31] MasterCard Transaction Data, 2009.
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[33] Octopus, Hong Kong: Octopus Citibank Credit Card. Retrieved 9/6/2010 from: http://www.octopus.com.hk/get-your-octopus/choose-your-octopus/bank-issued-octopus/citibank/en/index.html
[34] Global Mass Transit, 1/11/2009: *Contactless Smart Ticketing: A win-win deal for all stakeholders*. Retrieved 21/4/2010 from: http://www.globalmasstransit.net/archive.php?id=1291

Looking ahead

Continual innovation in smartcard ticketing systems will undoubtedly increase their appeal, as consumers opt for the convenience of using one card for multiple applications. One of the major beneficiaries of this technology will be international tourists who potentially could use one credit card on public transport services in different cities around the world.

Smartcard technology is fast becoming a standard feature of the consumer experience in modern cities, integrated into most new credit cards and taking on non-card forms such as mobile phones. As the examples in this paper (and countless other examples worldwide) show, Australian cities are only just catching up with the rest of the world in terms of ticketing technology. With many global cities now moving towards next generation multi-application cards, the take up and innovation in Australia's smartcard systems must be rapid if we are to keep pace with the rest of the world.

With this in mind, and given the long implementation process that can be expected for more complex transport networks, it is important that governments seeking to introduce smartcard ticketing do not adopt redundant technology. By the same measure, the potential for private sector investment and alternative revenue streams to flow from interoperability and integration with the credit card market also warrants serious consideration in the early stages of implementation.

Concluding remarks

As well as simplifying fare payments, the smartcard's capacity to track and record travel data has the potential to revolutionise public transport delivery. With virtual real-time information on the demand side of the transport market, service providers can optimise the supply of services and fare prices to ensure optimum asset utilisation. TTF believes that innovations such as smartcard ticketing are imperative to providing modern, efficient and appealing public transport systems.

Almost every smartcard ticketing system has encountered teething problems in the early stages of implementation. While it is desirable to minimise the public cost of implementation, the absence of a 'one size fits all' ticketing system makes it difficult to anticipate the extent of the ongoing costs that implementation may incur.

As was the case with London's Oyster card, phasing in smartcard technology is very much a long term process, and authorities should not be perturbed by minor difficulties that may arise. Rather, contract arrangements should be made carefully and revised where costs can be saved, competition promoted, and innovation exploited.

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