A Discussion and Update on Integrated Fares and Electronic Ticketing in NZ

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Abstract

Integrated fares and electronic ticketing are frequently advocated by transport planning authorities to promote public transport use. But how effective and necessary are integrated fares and electronic ticketing for urban NZ. This paper reviews the state of play in New Zealand in 2009 and draws some lessons from overseas.

Fare differentiation, the flip side of integrated fares, also has merit since operating cost structures and demand characteristics of bus, rail and ferry services can differ. Simple 1-3 zone systems can simplify fare structures but multi zone systems, such as the 14 zone system in Wellington, can complicate rather than simplify the fares for users.

Electronic ticketing potentially offers convenient cash-less payment and most of the smaller urban centres have introduced electronic smart cards. The expensive problem that remains is the conversion of rail from paper based ticketing to an electronic smart card system. The more so if the same system is to be compatible with smart card systems that are already working in Wellington and to a lesser extent Auckland.

Overseas experience is that simple fare systems can aid the introduction of electronic ticketing onto rail services. It is hoped that Auckland and Wellington can learn from the Hong Kong Octopus and avoid entangled in expensive and time consuming litigation as has been the experience of Sydney's disastrous TCard.

1 Introduction

Integrated fares and electronic ticketing continue to be advocated strongly by larger transport planning authorities as a central tenet in the promotion of public transport in New Zealand. But how effective and necessary are integrated fares and electronic ticketing for urban NZ. Are the two aims 'joined at the hip' or can they be introduced individually; one without the other? This paper reviews the state of play in New Zealand in 2009 and draws some lessons from overseas.

Section 2 presents a typology of fare and ticketing systems and shows that it is possible to have integrated fares without electronic ticketing and electronic ticketing with differentiated fares. Section 3 then defines what is meant by integrated fares and shows that the converse, namely 'differentiated fares', also has merit that is being overlooked. Section 4 introduces electronic ticketing and assesses the advantages of 'smart' cards. Section 5 summarises the state of play in New Zealand and shows recent ticketing developments in medium town NZ to be significant. Section 6 draws some lessons of the good, the bad and the expensive from overseas. Section 7 draws together some conclusions.

2 Fares and Ticketing Systems

Figure 1 presents a typology of integrated fares and ticketing. It shows it is possible to have (i) integrated fares without electronic ticketing and (ii) electronic ticketing with differentiated fares.

Figure 1: Integrated Fares and Ticketing

Fares	Ticketing System: Paper Based Tickets	Ticketing System: Electronic Ticketing
Integrated	Free Transfers within a time period (eg 2 hrs) using a 'paper' non smartcard / contactless system. Multimode travel passes. Often Flat fares/Zonal systems. Eg Melbourne MetCard	Fare structure allows free transfers with electronic smartcard ticketing system that may be stored value Eg Hongkong Octopus, Christchurch, Dunedin, Hamilton or stored travel pass or both stored value and Pass eg London Oyster
Differentiated	Different fares set by route, operator,mode with transfer trips incurring 'flag-fall' cost. 'Paper' based ticketing system e.g. Wellington, Nelson, Gisborne	Differentiated fares by service/mode/time period but with some or all operators using electronic smartcards that are operator specific eg Wellington Cable Car Multi Trip card, Hutt Valley Rider Multi-trip and, or able to be used on different operators

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3. Integrated Fares

What is meant by integration? The Concise Oxford Dictionary defines integrate as to *'combine parts into a whole'*, *'complete (an imperfect thing) by the addition of parts'*. What is important is the '*combining'* of parts which need not be the same. Thus bus fares can differ from rail fares in their structure and ticketing. By integrating fares we combine the bus and train fares and tickets into a *public transport* fare and ticket.

At the other end of the spectrum, the Concise Oxford Dictionary defines differentiate as to *'constitute a difference between or in'*, or to *'make or become different in the process of growth or development'*.

Unless deliberately managed, public transport fares and ticketing will *differentiate* over time to reflect local demand levels, cost levels, funding, administrative sophistication and anti-competition regulatory authorities. In broad terms, the bigger the urban area, the greater the level of fare and ticketing differentiation will be and the greater the challenge planners will face in re-integrating the individual fare and ticketing systems back into *'a whole'*.

This need not be a universally bad thing however since differentiated fares can have economic merit. It is reasonable for higher quality bus services provided commercially such as *'airport flyers'* to have higher fares. Likewise there is economic merit for longer distance peak rail services and cross-harbour ferry services that are characterized by higher long run marginal costs to have higher fares than short distance contracted bus services.

In a 'first best' economic world, the fare which, on the demand side, measures passenger's willingness to pay, should equal the marginal cost of providing the service. It would be highly unlikely for prices and marginal costs to be the same across public transport modes and services. Therefore differentiated fares should be the 'first best' pricing rule.

There is also the established economic rationale for services patronized by less fare sensitive passengers to be set higher fares; in effect *Ramsey* prices in which the deviation from marginal cost is proportional to the elasticity of demand, Ramsay (1927).

The downside of fare differentiation is the informational cost and uncertainty that complex and multi-product fares systems impose. Informational cost increases proportionally with ticketing products and fare structure complexity; and, the greater the 'cost', the less likely people are to use public transport. In this respect, Wellington and Auckland no doubt impose the greatest informational cost on public transport users in New Zealand. However when compared to the Byzantium fare and ticketing arrangements in Sydney which features 120 different rail ticketing products, Wellington and Auckland appear models of modesty.

Where the facilitative role of planning authorities add value is integrating fares for trips that involve transfers between modes (e.g. bus to rail), or between different operators. In this way, cross city trips or 'trunk and feeder' services can be made more attractive by removing secondary 'flag fall' fare components.

An integrated fare system seeks to combine fares for multi leg journeys into a single fare. For example, in the absence of fare integration, a passenger making a two leg trip involving a $1 two kilometre bus trip then a $3 ten kilometer rail trip would buy two tickets costing $4. If the fare system was 'integrated', the double 'flag fall' element will usually be removed rendering a combined bus-rail fare of say $3 in our example.

The revenue lost to the two operators will need to be offset against the gain to the passenger however. In many examples a subsidy will be involved. Indeed, it is the gain in patronage from the fare reduction (25% in the example above), reduced information cost and improved convenience that makes fare integration economically efficient rather than the transfer payment from providers to users.

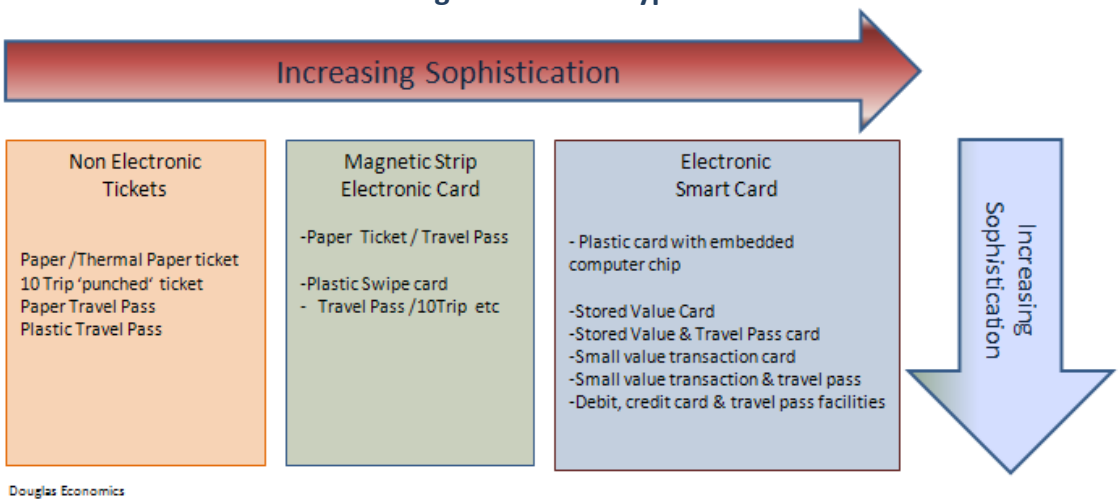
In New Zealand, there are several examples of combined bus tickets that allow free transfers between buses services within a 1-2 hour window. There are also examples of multi-mode travel passes that have been organized by operators to reduce the cost of a transfer.

Complete 'fare integration', usually invokes a *'blanket zonal fare system'* that treats a bus kilometre the same as a train kilometre. In this regard, Auckland has expressed the desire to introduce a zonally based fare structure with the same fares charged for bus and rail travel of a certain trip length.

4. Integrated & Electronic Ticketing

Ticketing systems describe the method of selling and validating tickets. The ticket could be paper as well as electronic. Figure 2 presents a typology of ticket types and shows how the level of sophistication increases from simple paper tickets to smart-card cards with retail debit facilities.

Figure 2: Ticket Types



Paper tickets are most often sold on the vehicle by bus drivers or train guards as is the practice in Wellington. Tickets can also be issued by ticket vending machines on rail stations or at bus stops, or as in Melbourne, via onboard tram ticket machines. It is worth noting that even with a smartcard ticketing system such as Snapper in Wellington, there will remain the need to issue some paper tickets for 'on the spot' travel unless buses are made 'pre-board' as is the case on some high use express bus routes in Sydney.

Electronic paper based tickets usually have a magnetic strip so that the ticket can be verified as it is 'swiped' through an electronic reader. Sydney and Melbourne use magnetized paper tickets whilst Hongkong and London use magnetic strip paper tickets for single journeys alongside their smart card systems.

Plastic electronic tickets are often used for 10Trip and multi-use cards. These tickets are also swiped through ticket reading machines. Some electronic cards may cover travel for a week, month or longer period. The card reader machine checks whether the ticket is valid or not. Plastic is preferred to paper simply because it lasts longer.

There are also different variants of electronic ticketing depending on the level of *'intelligence':* smart or 'not so smart' cards. The least sophisticated electronic tickets can be paper based using a magnetic stripe as used on Sydney rail services. More sophisticated electronic tickets will be written into plastic cards.

Smartcards usually store money (Hongkong Octopus) and sometimes they store both money and travel passes (as in London). Each time the passenger boards a bus or enters through a rail station barrier, the ticket is read electronically and money (or a trip) deducted from the stored value.

To be 'smart', a computer memory chip is embedded in the card to process and retain information. The card may be able to cap the maximum fare paid per day or week (as in Christchurch) or work out the cheapest fare by relaying information back and forth from the remote central computer. The memory chip also allows the card to store details of trips made for validation and informational purposes.

For an integrated ticketing system, the ticket or card should cater for transfers between services, operators and travel modes. Usually, the transfer will be discounted if made within a certain time period (say 1 or 2 hours).

An electronic ticket does not require any action by the bus driver however roving inspectors with smartcard readers are usually employed to check passengers have validated their tickets and are not over-riding.

A revenue clearing system is normally required for electronic systems that deduct 'money' from stored value cards so that revenue can be reimbursed to operator's bank accounts in a timely fashion (similar to eftpos).

Trip data may be stored electronically and then used to determine a revenue reallocation between operators. Alternatively, for paper tickets, transport surveys may be undertaken to determine reimbursement.

The electronic contactless smartcard is the most sophisticated ticketing system. As such it has several advantages over other ticket types. However, electronic smartcards have disadvantages. Table 1 on the following page lists the main pluses and negatives.

An easy to understand fare system and a convenient ticketing system is clearly desirable from a passenger perspective. Therefore integrating fares and ticketing insofar as they make travel easier is to be supported. However it is worthwhile commenting that integrated fares and ticketing is not necessarily a burning issue for most public transport users.

In terms of bus-rail integration, only one in eight Tranz Metro Wellington users use bus to get to and from their station varying from 7% on the short distance Johnsonville line to 16% on the longer distance Paraparaumu line. The percentage has also remained reasonably constant between 1998/99 and 2004 based on market research surveys undertaken by Douglas Economics (2004).

Tranz Metro Wellington uses simple paper based ticketing. Nevertheless, passenger satisfaction surveys conducted by Kiwi Rail have give 'the range of tickets available (Monthly, 10Trip, Day return, Single etc)' the highest satisfaction rating of 95% of the ten

attributes surveyed. By contrast, the attribute with the lowest satisfaction was 'ability to get information on delays' at 57%. Moreover, in terms of attribute importance, the 'range of tickets' was averagely 'important' being ranked sixth out of ten service attributes. Of course, these findings are based on surveys of 'existing' rail users. The attitudes of non rail users may be different and it could be possible that the existing fare and ticketing system is dissuading some latent demand.

Table 1: Plus Points & Minus Points of Contactless Smartcards

Plus Points	Minus Points
Reduced dwell time possible by fast automatic scan of ticket	Card reader system may be slow in operation
Ticket can be validated without removal from wallet or purse	Card reader system may be slow in operation. Passengers have to 'tag off' as well as 'tag on' to pay correct fare and avoid overpaying. Tagging off may slow disembarking especially on busy buses
Convenient - Passengers do not need to carry cash	Cash fare ticketing system still usually required for occasional/exceptional users (eg day tourists)
Less cash to process reduces accountancy costs	High initial software and equipment costs and unless buses become ticket 'pre-boarding', cash accountancy costs will continue
Avoided/reduced commission paid to retailers/merchant's (eg newsagents) in selling Ten Trips etc	May result in fewer sales outlets to purchase tickets/reload cards
Protects revenue by detecting usage and enabling easier comparison of vehicle takings	Scope for passengers to 'tag-off' early and over ride.
May encourage public transport use especially if part of a small value transactions system.	Inspectors need computer readers to validate tickets
Encourages use by capping maximum daily /weekly fares paid	Fare discount achieved by raising cash fare more than would otherwise be the case
Can combine fares onto one ticket Added flexibility by incorporating 'pay as you go' and travel pass facilities	Integrated fares are also possible with a paper based ticketing
Improves cash -flow for operators by up to several weeks depending on the tickets replaced (10 Trip, Weeky or Monthly) Ensures automatic 'next day' bank deposit of ticket revenue	Risk of a system failure on revenue and operations
Less friction wear thus equipment lasts longer Enables time based demand management by differentiating fares by time of day	Threat of hacking of stored value requires added security system
Can provide real time information on passenger trip patterns Anonymous or user registered with photograph Trip data can be requested by police in crime investigations	Civil liberties compromised by ability to track individual passengers

ARTA estimates its proposed integrated fare plan (see section 3.2) could result in 2%-3% increase in patronage, ARTA (2006). Based on 50 million boardings and an average yield of $2 per trip, the annual gain in revenue would be around $3 million, the present value of which would be $21 million (discounted at 7% a year for 10 years). This is indicative of the maximum break-even lifetime cost (capital plus operating) for such a system without factoring in any revenue loss from reduced transfer revenue on the one hand and economic externality benefits from diverting car users on the other.

Patronage and revenue response is only one component of the benefit equation. There are also potential operational and capital cost savings from shorter dwell times, lower accounting costs, revenue protection and improved financial data (see Table 1).

5. Developments in New Zealand

Integrated fares and electronic smartcard ticketing have been introduced in New Zealand. In some cities, operators have initiated the introduction of combined fares and smart cards; in other cities, Regional Councils have been instrumental in their introduction.

Christchurch, Dunedin and Hamilton have established electronic smart cards and operators in Tauranga, New Plymouth, Hawkes Bay, Wanganui and Palmerston North, have recently introduced basic smartcards. In Wellington, Infratil has developed a debit smart card 'Snapper' and as of the end of August 2009, the card has been introduced onto three Wellington buses services owned by Infratil and Adams Coachlines in Whangarei.

Fare systems vary in complexity by regional centre. The level of fare integration is reflected in the availability of free transfers between bus services or between rail and bus varies by regional centre. Christchurch, Dunedin and Hamilton have an integrated zonal fare structure effectively allowing free transfers between bus services. Auckland and Wellington offer a range of combined bus and rail tickets for daily, weekly and monthly use within a largely zonal fare system although not all services and modes (the ferry and cable car are not included in Wellington) are covered.

Typically smaller regional centres have flat fare systems. Most offer free transfers between same operator bus services within a time window of limit of 1 or 2 hours. A few offer free transfers between different operators. Most have a defining public transport feature. Invercargill has a free bus service 'The Freebie'. Nelson has a higher priced double-decker tourist bus service. Palmerston North offers a free service for Massey University staff and students.

Table 2 on the following page presents a summary of developments by urban area.

5.1 Auckland

Auckland has a range of 'pay as you go' tickets including cash, Ten Trip (paper and electronic) and stored value swipe cards. Fares for contracted services are set by Auckland Regional Transport Agency (ARTA). An eight stage (zone) system is used for buses and a 6 stage system for rail. There are also two flat fares for 'The Link' ($1.60) and the inner city service (50c). A stored value card is available on most bus services.

Veolia uses a paper based Ten Trip ticket. Fare discounts for Ten Trip and Stored value cards vary but are typically around 10%.

Table 2 Fares and Ticketing by Selected Urban Area
The State of Play August 2009

	Travel Modes Available	Main Bus Companies	Bus Fare Structure	Transfer Treatment	Electronic Ticketing	Integrated Ticketing
Auckland	Bus, Rail, Ferry	5 main bus companies	Stage fare structure increasing with distance. Some special fares and discounting. Fare discounts for multi-use, stored value cards and travel passes.	No free transfer generally available for pay as you go tavel. Range of combined passes between bus, rail and ferry and between bus services or modes.	Stored value tickets and 10Trip swipe cards available	Some combined multi-modal and multi bus service passes available: 2hr (Northern Busway), day, week, monthly passes.
Wellington	Bus, Rail, Ferry, Cable Car	2 main bus companies NZ Bus and Mana Coaches	Zonal fare structures for bus and rail with some special fares for commercial bus and rail services and discounting. Cable car and ferry have different fare structures. Fare discounts for multi-use tickets and travel passes.	No free transfer generally available between bus services or modes. Combined Hutt Valley rail-bus pass ticket and other combined ticket products available.	Snapper stored value and small value transaction smart card introduced onto Go Wellington, Runciman Motors and Valley Flyer bus services. Multi use electronic swipe cards in use on bus (e.g. Mana Coaches) and cable car. Paper based rail tickets	Hutt Valley bus-rail ticket and multi bus service passes available.
Christchurch	Bus,Ferry	3 main bus companies	Zonal fare structure covering bus and ferry. Metrocard discount	Free transfers within 2 hrs for inner zones and fare capped daily and weekly travel with Metrocard	Stored value smartcard with capped daily and weekly fare limits	Metrocard is valid on buses and Diamond Harbour ferry
Dunedin	Bus	1 main plus two other bus companies	Zonal fare structure with different fare levels for different operators	No transfer discount	Stored value smartcard called GoCard	GoCard valid on all bus services
Hamilton	Bus	1 main operator	Flat fares (free City Loop)	Free transfer with 60 minutes	Stored Value BUSIT card	BUSIT valid on all bus services
Whangarei	Bus	1 operator	Flat fare	Transfer discount	Snapper (No Tag Off)	na
Tauranga	Bus	1 operator	Flat fare	Free transfer within 60 minutes	Multiuse Swipecards	na
Gisborne	Bus	1 operator	Flat fare	No	Paper ticket, 10 Trip	na
New Plymouth	Bus	1 operator	Flat fare	Free transfer within 60 minutes	Smartcard + Paper ticket	na
Napier	Bus	1 operator	Zonal fares	Free transfer within 60 minutes	GoBay Smartcard + Paper ticket	na
Palmerston N.	Bus	1 main operator	Flat fare with free Massey service	Free transfer within 60 minutes	GoCard swipecard	Fielding service not integrated
Wanganui	Bus	1 operator	Flat fare	Free transfer within 60 minutes	GoCard swipecard	na
Nelson	Bus	1 city operator	Flat fare	Not applicable	Paper ticket	na
Invercargill	Bus	1 main operator	Zonal fares - free offpeak in CBD	Cross city fare available & free CBD service	Paper ticket	na

There are day, week and monthly passes allowing travel on different combinations of services. Unlimited monthly travel for $210 on bus, rail (Papakura-Waitakere) and North Shore-CBD ferry services is provided by the Discovery Pass which was introduced by operators in collaboration with ARTA.

A range of cheaper monthly passes are available based on a two zone structure (A zone defining the city area and B zone defining suburban areas and with different services included. There are also three monthly rail passes for travel on Stagecoach's 50c CBD bus service.

The most recent ticketing development is the Northern Pass ticket, introduced in February 2008, on the opening of the Northern Busway. The Northern Pass is a transferable ticket similar to the Discovery Pass (but with fewer services included) that allows travel on all North Shore buses as far as Albany in the north and Greenhithe in the west to Auckland City. The ticket is also valid on inner Auckland trains between Britomart and Newmarket/Glen Innes. A two hour ticket is available which effectively provides a free transfer 'cash' fare. One day (all day or after 9am) and seven day 'passes' are also available. Fares are based on zones with the North Shore (B zone) divided into two zones: Upper Zone (from north of Kyle Road and Upper Harbour Drive taking in Albany and bays) and Lower Zone which covers the area south of the Upper Zone down to the Harbour Bridge.

In terms of the future, ARTA has stated its desire to introduce a common zonal fare structure for bus and rail services in Auckland and an integrated multi-modal smart card system, ARTA (op cit). Its stated plan is for:

- A zonal fare structure
- One fare for all travel within a zone apart from short trips
- A short-distance fare for short distance travel (approx 3 kilometres)
- Uniform fare products across all operators i.e. remove all operator specific products
- Integrated fares for bus and train
- Point to point fares retained for ferries
- Niche service fares as appropriate
- An integrated multi-modal smart card ticket system

On July 22nd 2009, ARTA selected a consortium made up of French electronics company, Thales, in partnership with the Bank of New Zealand and Transfield services, as the preferred tender to deliver an integrated ticketing system for Auckland. Implementation of the system will be dependent on confirmation of funding from NZTA. The two rejected consortium were Downer EDI and Snapper Services Ltd.

The value of the contract with Thales is not known. The initial capital cost estimate was $80 million (60% NZTA funding) and the operating cost was $6.5 million p.a. GWRC (2009).

The system will be based on a swipe on – swipe off card and will use automated gates at rail stations and smartcard 'readers' onboard buses and ferries. Reload devices will be available at selected rail, bus and ferry stations. The system will be similar to London's Oyster

system. Like Oyster, the intention is to phase in the functionality of the system with buses first followed by ferry and rail services.

5.2 Wellington

In Wellington, there is a mixture of commercially operated bus services (and 'The Capital Connection' rail service between Wellington and Palmerston North) run without subsidy and services contracted and financially supported by the Greater Wellington Regional Council (GWRC). The combination of modes, operators and contractual arrangements places Wellington alongside Auckland in terms of the complexity of the fare and ticketing system.

Bus and rail fares are set by the GWRC for contracted services under an umbrella 'Metlink' brand. A 14 zone + Trentham rail station fare structure replaced Tranz Metro's simpler to use station to station fare matrix; rail passengers now have to do an extra 'lookup' to first work out their zone before 'looking up' their rail fare.

Commercial bus services such as the Valley and Airport Flyer have higher fares than the zonal system as does the East by West ferry service.

Collaborative day, monthly and quarterly combined rail and bus tickets have been gradually introduced by operators. Wellington Integrated Ticketing Ltd provides a clearing house for distributing revenue earned on combined tickets back to operators. Money is usually disbursed on the basis of bus and rail usage on a monthly basis. However, for cash fares there is no discounting for passengers making transfer trips and therefore passengers pay a double flag fall.

Different ticketing systems are used by bus, rail and ferry operators. Mana Coaches uses a smart card electronic purse offering a 20% discount on cash fares. Thermal paper tickets remain available on all bus services.

Tranz Metro sells tickets at main stations such as Wellington, Waterloo and Upper Hutt, at other outlets and also on trains. East by West Ferries sells tickets onboard ferries. The Cable Car has a 10, 20 and 30 trip electronic swipe card.

Snapper is the most noteworthy ticketing development. Snapper is a contactless small-value debit card developed by Snapper Services, a division of Infratil. NZ Bus, also owned by Infratil, began the introduction of Snapper in 2008. The smartcard is now on *Go Wellington*, Hutt Flyer and Runciman bus services.

Snapper replaced the 10Trip card. By August 2009, Snapper was accounting for 60% of bus rides and by October 2009, Infratil expects Snapper to reach 100,000 cards 'on issue', Infratil (2009).

Snapper is similar to Eftpos but with public transport providing an 'anchor' merchant. Snapper can also be used at cafes, hairdressers, newsagents, cinemas and other

participating retail outlets. Retailers buy a contactless card reader costing around $200 that works in conjunction with the eftpos terminal.

A key difference with Eftpos is that people need to purchase their Snapper card. Usage is then free unlike Eftpos which charges transactions. Snapper also does not require a pin number or 'swiping' like Eftpos.

Snapper cards can be reloaded at some retail outlets, by credit card or via the Internet by clipping their card via a USB device to a computer.

Integrated ticketing is ranked as a high priority by the GWRC. The Draft Regional Passenger Transport Plan also contains the objective of developing *"a ticketing system that is integrated and transferable across all operators"* and the policy to *"support the implementation as funding permits of an integrated ticketing system under GWRC or other public agency control which enables all train, bus and ferry journeys to be paid with a single smart card".* The Regional Transport Programme 2006/7-2016/17 budgets for $13.3 million over ten years for spending on integrated bus and rail integrated ticketing.

The most costly obstacle to a universal region wide ticketing system is the conversion of the paper-based rail ticketing system. Changing to a station barrier electronic ticketing system would be expensive. Guards who currently issue and check tickets onboard trains would need compensation if made redundant. Alternatively, there would be lower wage cost savings if guards were retained.

5.3 Christchurch

Christchurch bus services are provided by three main operators: Red Bus, Leopard and Christchurch Bus Services. There is also a Diamond Harbour ferry and a city centre historic tram run largely as a tourist attraction.

Christchurch has introduced an electronic smartcard for its bus and ferry services. The smartcard, called Metrocard, was initiated by the regional council Environment Canterbury (EC) to encourage patronage growth and speed up boarding times, particularly at Christchurch bus interchange, where bus space during the peak is at a premium.

The electronic Metrocard system was developed by ERG, an Australian based electronics company with expertise in ticketing systems. The Metrocard is waterproof with an expected lifespan of four years. Each card has a unique number that is registered to each cardholder so that if the car is lost or stolen it can be cancelled and the remaining money transferred to a new card (there is a small charge for replacement cards).

EC has made the Metrocard a contract condition with bus operators. The Metrocard is used on all Metro services including Red Bus, Leopard, Christchurch Bus Services, Orbiter, Metrostar and the Diamond Harbour Ferry.

As part of introducing the Metrocard, EC restructured the fare system. A three zone time based fare system was introduced with double flag fares removed. Some revenue compensation was paid to operators.

To encourage take-up, the Metrocard is free and requires a minimum initial cash load (and recharge) of $10. This can be at Metroinfo or when passengers board the bus. To encourage use, the Metrocard provides a discount of about 25% on the cash fare (the same as the 10Trip card it replaced). Also unlike the Metrocard, passengers who pay cash do not get free transfers within zones 2-3 and for trips within the city centre (zone 1) only one free transfer within two hours is allowed. Similarly, the airport bus service, which is registered as a commercial service, has a cash fare of $7 in 2009 whereas using the MetroCard reduces the single fare to $2.10.

The maximum Metrocard charge per day was set at $4.20 in 2009, equivalent to two single trips. Thus, additional trips made during the day are free which encourages off-peak use. The Metrocard also provides unlimited travel for a week for $21 (Monday-Saturday) by capping the maximum debit automatically taken from the card when boarding the bus. Thus, the Metrocard also encourages weekend use.

5.4 Dunedin

Dunedin has an electronic smart Go Card that is valid on all bus services. The GoCard is a debit smart card that stores money for travel on buses and offers a 10% discount on cash fares (the same as the 10Trip it replaced). The GoCard is the property of the Otago Regional Council (ORC). Stored credit is non-refundable but the ORC will cancel lost or stolen cards (with proof of purchase) and transfer the balance to a new card. GoCards are available for purchase from local buses and the ORC Office.

Dunedin has a zonal fare structure with a one zone adult cash fare of $1.90 (1.71 using the Go Card). Slightly higher fares are set on the commercially registered Citibus Normanby – St Clair and St Kiloda – Brockville – Halfway services. A different fare structure is also set on the Palmerston - Dunedin bus service. There is no discounting of fares for passengers making transfer trips.

5.5 Hamilton

Hamilton introduced an electronic smartcard in 2003. Environment Waikato (EW), the regional council, initiated the BUSIT smart card, determined the technology and purchased the equipment. The two bus operators (the largest being GoBus) installed the ticket readers onto their Hamilton buses. Use of the BUSIT card gives a 30% discount on the cash fare.

The card can also be used on buses in Raglan and Paeroa as well as Hamilton. Money is loaded onto the BUSIT card by paying cash on the bus or by eftpos at the Hamilton City Transport Centre. The card is read by a card reader (see photograph) on boarding the bus. A 60+ card designed for people aged 60 and over is also available.

A flat fare structure is used with free transfers on city buses if made within two hours either by cash fare or with the BUSIT card. A free central city shuttle operates a one way loop service around the Hamilton central city every ten minutes on weekdays between 7am-6pm and on Saturday 9am-1pm.

5.6 Whangarei

Infratil was awarded a contract to run bus services in 2008 for five years from September 2009, the Snapper smartcard will be introduced onto Adams Coachlines. Adams Coachlines operates a simple flat fare structure so unlike Wellington, users will not need to "tag off" on disembarking. Tourists from Wellington will be able to use their Wellington Snapper card on Adams Coachlines.

5.7 Tauranga

Bus services are provided by the Bay Hopper under contract to Environment Bay of Plenty (EBP) regional council. Fares are based on a zonal system with a maximum adult cash fare of $3, $1.80 child (August 2009). Free transfer tickets are available for travel within the same zone within 60 minutes (excluding return trips).

A Smartride swipecard was introduced in 2003 after a competitive tender round which offers a discount on the cash fare of 20%. There is also a Daysaver offering travel anywhere on the Tauranga network for $6 ($4 child). A Wayfarer system was introduced in 2004/5 on Rotorua urban, Rotorua to Tauranga and Katikati to Tauranga which are also contracted by the EBP. Both the ERG and Wayfarer systems were paid for by EBP and LTNZ.

5.8 Gisborne

Urban bus services are provided by Gisborne Taxis and Bus Line Ltd. Two buses are used on six routes to and from the city centre at $1.20 per trip cash fares. There is also a $12 ten trip ticket for convenience but no discounting of fare for any transfers made.

5.9 New Plymouth

Urban bus services are provided by one operator with three other operators providing services within the Taranaki region. A Smart card ticketing system was introduced in 2009 and is available on all services with a 3 digit route number. The initial card costs $15 ($5 for the card itself and $10 of loaded bus fares). Discounts are made at the Ten Trip rate which remains available. The fare system allows for free transfers from one bus route to another within an hour.

5.10 Napier and Hastings

Bus services are provided by Nimons under contract to the Hawkes Bay regional Council (HBRC). A four zone fare structure is used. A goBay smartcard is available which costs $7 with a top ups of $10 multiples. The goBay smartcard can be purchased and topped up from bus drivers and offers a 25% discount on cash fares. Transfers are free within the same travel zone if made within the hour.

5.11 Palmerston North and Wanganui

Bus services in Palmerston North and Wanganui are operated by Tranzit Coach Lines. An electronic swipe card called GoCard developed by ETS Auckland was initiated by Tranzit to replace a waterproof Ten Trip orange card to tighten up revenue control. The system is similar to the Hamilton BUSIT system.

Horizons Regional Council assisted financially with the introduction of the card in 2005. Users swipe the GoCard over a reader each time they board the bus. The cost is then deducted from the stored value of the card. The Go Card costs $10 to buy and includes $5 prepaid travel (net cost is $5). The card provides a 25% reduction on the cash fare of $2 for adults (note Massey Students/staff free). Transfers are free between city buses if made within one hour.

5.12 Nelson

Nelson has no electronic ticketing. New Zealand Leisure Travel provides a city centre service marketed as 'The Bus' for a cash fare of $2 single. There is also a double-decker tourist orientated service ($7.50). Suburban Bus Lines provides a service to Stoke/Richmond. There is no transfer fare discount.

5.13 Invercargill

Invercargill provides a free bus service within the town centre ('The Freebie') between 10am and 2pm otherwise fares are $2 single, $3 cross city, $17 Ten Trip $55 Monthly Pass and $4.50 for an all day pass. Ticketing is paper based.

6. Electronic Ticketing Overseas – 'the Good, the Bad and the Expensive'

Octopus in Hongkong and Oyster London provide two successful examples of the large scale introduction of electronic ticketing. The Octopus, initiated by the mass transit authority is regarded as the world's first smartcard ticketing system that debits travel on a discounted 'pay as you go' basis and that has been extended into a small value transaction system with wide application.

The London Oyster card was introduced by Transport for London (TfL) and offers travel pass facilities as well as 'pay as you go' travel. Although the Oyster card cannot yet be used for other purchases, smartcards such as BarclayPlus have been developed that incorporate Oyster alongside debit and credit facilities. Both Octopus and Oyster have not resulted in the removal of cash tickets but not offering change on Hongkong buses and heavy price discounting in London of the Oyster card have reduced the use of cash tickets.

By contrast, the introduction of smartcard electronic ticketing in Sydney and Melbourne initiated by State Governments has been expensive and delayed.

The experience of Sydney's proposed TCard suggests that complex ticketing products need to be avoided: a fundamental change in technology almost certainly requires a fundamental review of ticketing products. Therefore, fare structures and products need to be simplified to avoid software and implementation problems that in Sydney's case resulted in project termination and litigation.

The Miki Melbourne system has also been expensive and late. In mid 2008, the cost was estimated at $1 billion with the schedule three years late.

Both Sydney and Melbourne experienced rancorous tendering processes with rival consortiums damaging each other and seeking legal redress for failed bids. It is hoped that such costly litigation is avoided in Auckland.

An alternative to seeking the 'holy grail' of one smartcard system to rule all urban public transport in New Zealand, is to establish guidelines that promote smartcard inter-operability and, in this context, the UK based ITSO provides a useful precedent.

7. Concluding Remarks

Integrated fares and electronic ticketing are frequently advocated by transport planning authorities to promote public transport use. What is sometimes forgotten is that differentiated fares also have merit in reflecting the supply and demand characteristics of different public transport operations.

Zonal fare systems can simplify fare structures but not always. Many smaller New Zealand urban centres have simple flat fare systems. Amongst the three larger centres, Christchurch has the simplest zonal fare structure and Wellington the most complicated with 14 zones plus Trentham rail station.

In terms of electronic ticketing, eight of the smaller centres reviewed have introduced smart cards to varying degrees of sophistication: Whangarei, Tauranga, Hamilton, New Plymouth, Hawkes Bay, Palmerston North and Dunedin. Three urban areas have not introduced smart cards as of September 2009: Gisborne, Nelson and Invercargill.

The Auckland Regional Transport Authority (ARTA) selected a French based consortium as the preferred tendered to deliver an integrated ticketing system for Auckland. The system will be based on a swipe on – swipe off card and will use automated gates at rail stations and smartcards 'readers' onboard buses and ferries.

In Wellington, Snapper a contactless small-value debit card has been introduced on bus services owned by Infratil and is used for 60% of bus rides. Mana Coaches including Newlands also has a smartcard electronic purse as does the Wellington Cable Car. The GWRC retains the ambition to introduce an integrated electronic fare system over the region. The most expensive and problematic issues will be the conversion of the paper based ticketing systems currently in place on rail.

Overseas experience from London and Hong Kong is that simple fare systems can aid electronic ticketing and that phased introduction with bus first and rail last are more likely to succeed than a 'big bang' network wide introduction. In some ways, this process is already in motion in New Zealand. Conversion of rail remains the biggest problem and it is hoped that Auckland and Wellington can learn from the Hong Kong Octopus and avoid entanglement in expensive and time consuming litigation as has been the experience of Sydney's disastrous TCard.

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