Bus service reform in Melbourne – the last 5 years

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Abstract

After fifteen years of little change, Melbourne's bus services have altered significantly in the last five years. Underpinned by policy that supports greater public transport use, reform was driven by three major government programs; SmartBus, minimum standards upgrades and local area service reviews.

This paper briefly compares the distribution of each service initiative. Minimum standards upgrades were most widespread, benefiting many middle and outer suburbs. Middle suburbs gained most from SmartBus, especially the City of Manningham where it operates on city as well as orbital routes. And the service reviews were most influential in fringe areas to the west, north and south east.

Evaluating the quality of service planning in Melbourne, based on the implementation of recent reviews, is the paper's main focus. Revised timetables were compared against good planning practice. Significant potential for improved network legibility, efficiency, connectivity with trains and scheduling of multi-route corridors was found and could warrant further work.

The extent to which interplay between each program has shaped local networks is also examined. Sometimes programs worked in concert, improving both legibility and service. Other times new routes were simply overlaid on the existing network, reducing legibility and potentially wasting resources. Cases where successful lobbying for marginal routes, unsupported by any program, may have further lowered efficiency are also discussed.

The paper concludes that Melbourne has seen significant recent bus service improvements. However it also finds that the quality of service planning has varied and that a more effective network may be possible within existing resources.

Key words: service planning, buses, networks, patronage

1. Introduction and method

The last five years have seen an expansion of Melbourne metropolitan bus service. New SmartBus orbital services enable previously difficult cross-suburban trips. More local routes expanded coverage in outer suburbs. And minimum service standards mean that most areas now have early evening, Sunday and public holiday transport, sometimes for the first time. Patronage responded with the number of passenger boardings at forty year highs (Kosky 2009).

Increased government funding of bus services made these changes possible. Realising that large cities cannot build their way out of congestion, metropolitan planning strategies favoured a greater role for public transport. For example, *Melbourne 2030* proposed an urban growth boundary, development around transport hubs and a modal share increase for public transport from nine to twenty per cent of motorised trips by 2020 (State of Victoria 2002).

2006's *Meeting Our Transport Challenges* (MOTC) marked the peak of political commitment to buses. It confirmed and expanded the SmartBus program of frequent cross-suburban routes along major roads. Wider spans, including Sunday service, were proposed for many routes. Train, tram and bus timetables were also to be synchronised by year's end (State of Victoria 2006).

MOTC set the bus agenda for the next five years. However almost immediately after release attention shifted to trains due to surging patronage and falling reliability. The 2008 *Victorian Transport Plan* reflects this change, with major rail projects displacing some MOTC bus initiatives like the Blue Orbital. Rail matters have remained prominent, notably during the 2010 State Election campaign, which resulted in a change of government (Lesman et al 2011).

The rail emphasis continued in 2011, with a new train timetable significantly increasing services. There were still some bus upgrades and new routes, but the pace had markedly slowed. Government budget papers also contain no plans for large future bus service increases.

Consequently bus service planners have returned to an environment of fixed or only slowly growing resources. Improvements may only be possible if offsetting savings are found from rationalising underperforming or duplicating routes. The ability to exploit such efficiencies depends on the quality of bus service planning, which is the key theme of this paper.

Simple service changes can be measured by comparing past and current timetables. This works where changes are purely quantitative, for example an existing route gaining Sunday service or being directly replaced by a higher-frequency SmartBus. The addition of routes can be measured in terms of catchment population served, route kilometres or service kilometres added. Counting route kilometres does not account for frequency but is still useful when comparing routes of a similar service standard, eg SmartBus.

Measuring more complex change is more difficult. For example revised bus timetables may connect with trains or lessen waits by evenly spacing services. Rerouting may improve directness and legibility, again making the service more attractive. Changes like these exemplify effective service planning but are harder to quantify than simple service gains.

Counting the proportion of review recommendations implemented is another possibility. While suitable for a rough score sheet, this does not distinguish major from minor changes. Also a change implemented in response to a review may vary from that recommended, presenting further measurement difficulties.

This paper instead assesses the quality of service planning against accepted principles of good network design and scheduling. Routes and timetables were reviewed for legibility, connectivity and effective frequencies along multi-route corridors. To fairly reflect modern planning practice, only areas with major changes such as a significant implementation of a bus review were studied. Both changed and unchanged routes were examined because the service reviews covered all routes in an area.

A change to one route may affect its relationship with others. Moving or rescheduling other routes may be necessary for an efficient network. The interplay between planning for different parts of the network is discussed later, with examples showing where this has and has not been done. Finally there is a brief discussion on the extent to which recent changes have increased patronage and occupancy and whether Melbourne has performed as well as elsewhere.

2. Spread of each initiative

Recent bus service improvements in Melbourne have largely been based on three initiatives; local bus service improvements (often minimum standards upgrades), SmartBus, and bus service reviews. The extent of their implementation is compared below.

2.1 Minimum standards upgrades

As recently as five years ago most of Melbourne's 300 bus routes operated to narrow spans unsuited to today's working, shopping and recreation patterns. After 7pm, Sunday and public holiday service was rare (Currie et al 2003). Many services also finished at midday on Saturdays; a relic of past trading restrictions.

Some routes gained limited Sunday service in 2002. Four years later *Meeting our Transport Challenges* included new minimum service standards (MSS) for over 250 routes. MSS specify at least hourly buses until 9pm, seven days per week (State of Victoria 2006).

MSS implementation was fast and widespread. In 2001 Melbourne's largest shopping centre (Chadstone) was served by a single route on Sundays, operating every 70 minutes. Today ten routes, typically every 30 to 60 minutes, serve the centre on Sundays.

While delivery fell short of the proposed 250 routes, few suburbs now lack a basic daily service. MSS made transit possible for more trips and increased passenger convenience and independence (Bell and Currie 2007). It also won wide public acceptance, with higher patronage elasticities than typical for bus service improvements (BusVic 2009). Implementation was also sufficient to make MSS the most extensive of the bus improvement programs.

2.2 SmartBus

SmartBus is a network of premium service routes along major roads linking major trip generators. Spans/frequencies are like trains on weekdays and somewhat less on weekends. Early plans were for a 900 km network on main roads (State of Victoria 2006).

The last five years has seen SmartBus expand from 69km to 450km (DoT 2011). Operating services include four freeway City-Manningham expresses (905, 906, 907, 908), three orbitals (901, 902, 903), and one radial (900) to Rowville. Route 703, one of the two pilot routes, has SmartBus branding but runs to a limited timetable. Patronage increases of up to 50 percent over the previous service have been recorded (Kosky 2007).

Like minimum standards upgrades not all planned SmartBus routes eventuated. Nevertheless SmartBus has transformed Melbourne's high service public transport network from an asterisk to a web, improved mobility in many middle suburbs and delivered substantial patronage gains.

2.3 Bus reviews

Melbourne's buses had not been comprehensively reviewed for years. They had the nation's shortest operating spans (Currie et al 2003) and an overwhelming case existed for restructuring (Currie and Tivendale 2010). Sixteen reviews, each covering two or three local government areas, took place between 2007 and 2010. An inclusive process involving public workshops was followed (Currie and Tivendale 2010). Review recommendations were intended to boost network coverage, connectivity and legibility and generally aligned with good planning practice discussed below.

As well as gains to passengers, improved legibility has elsewhere been shown to be the single most cost-effective means to grow patronage, with benefits exceeding costs (TAS Partnership 2002 – quoted in Currie and Wallis 2008). Service increases alone generally have patronage elasticities of around 0.35, approximately doubling long-term (Currie and Wallis 2008). Melbourne's MSS upgrades sometimes exceeded 1, demonstrating the demand for wider span (Bus Vic 2009). Simultaneously upgrading and simplifying is likely to improve results further and lessen disquiet over withdrawn or altered routes due to a better mix of gains and losses.

Approximately 20 per cent of review recommendations were put into practice across Melbourne (BusVic 2010). Implementation was highest (about half) in established areas that were reviewed early (notably Maribyrnong/Hobsons Bay/Moonee Valley) and the fringe municipalities of Wyndham, Whittlesea and parts of Cardinia/Casey. Elsewhere the reviews had less influence, with under ten percent implemented in Knox/Maroondah/Yarra Ranges, Manningham/Whitehorse/Monash and inner Melbourne.

This limited take-up marks the bus service reviews as the weakest of the three bus programs discussed here. While this low priority might have allowed MSS improvements to proceed quicker, it carried risks. These include the entrenchment of network inefficiencies and lost public trust in not fulfilling expectations raised during the extensive public consultation process (Currie and Tivendale 2010). Nevertheless in some areas review implementation has been sufficient to provide an insight into the quality of service planning and is discussed next.

3. Quality of bus service planning

There is widespread agreement on the service characteristics that encourage bus use. Frequency, coverage, reliability and network simplicity are commonly cited (Nielsen 2005, Currie and Wallis 2008). Public consultation during the bus reviews similarly indicated span (particularly evenings and weekends), frequency, coverage and connectivity as important (Currie and Tivendale 2010).

Good service planning can address these concerns but funding is typically insufficient to meet all demands. Its aim in a constrained environment is then to deliver the best possible routes and timetables from available resources. Hence service planners must reconcile interdependencies, such as coverage versus frequency, speed, directness and forced transfers.

Given some service to start with, an effective network with frequent, direct and well-connected routes is feasible provided passengers accept the need to transfer for some trips (Walker). This can be based around the development of frequent service corridors of parallel routes carefully

timed to optimise frequency in the common busiest section before fanning out to service lower density areas Nielsen and Lange 2010).

Where density or patronage does not justify high frequency, circumferential local routes could operate at harmonic headways to evenly connect with radial trunk services to form a web-like timed transfer network with minimal waiting. An example is Perth's 98/99 Circle Route, whose 15/30 minute weekday/weekend frequency harmonises with 15 minute off-peak train headways (Transperth 2011).

A harmonised frequency network may require adjustments to bus route lengths to avoid excessive layover times. Where coverage is affected nearby routes may need revising to retain coverage or avoid duplication. While the example provided by Clever (1997) refers to the integrated timed transfer Swiss national rail network, it is equally applicable to suburban buses, and likely easier to implement.

The above types of bus network reforms are the most cost-effective means of boosting service and attracting passengers (TAS Partnership 2002 quoted in Currie and Wallis 2008). City-wide Australian examples include Adelaide's 'Go Zone' frequent service corridors and Perth's harmonised train and bus network, both of which successfully increased patronage (Currie and Wallis 2008).

To assess bus service planning in Melbourne against the above best practice, routes will be examined for legibility, timetable harmonisation with trains and the extent to which parallel routes maximise combined frequencies. The local networks of Wyndham, Cardinia and Casey were selected due to their substantial recent bus review changes. Because all routes were reviewed, both routes that changed and those that did not are included.

3.1 Bus network change in Wyndham, Cardinia and Casey

Wyndham's new network commenced in April 2010. All routes had new timetables, ranging from small adjustments to MSS upgrades. Four (416, 439, 442, 443) had route changes. In addition two routes (438, 440) were deleted while four (446, 447, 448, 449) were created.

Cardinia/Casey's new network started in December 2010. Out of 40 routes, 13 had route changes and 23 had timetable changes (ranging from minor adjustments to MSS upgrades). One route (827) was deleted while seven new routes (831, 846, 847, 891, 898, 924, 925) were created. Key improvements included coverage, span and sometimes frequency.

3.1.1. Route and network legibility

Legibility was tested by examining local network maps for the central areas of Hoppers Crossing/Werribee (Wyndham), Pakenham (Cardinia) and Cranbourne (Casey) as it is these areas where the majority of routes converge. These maps appear below:

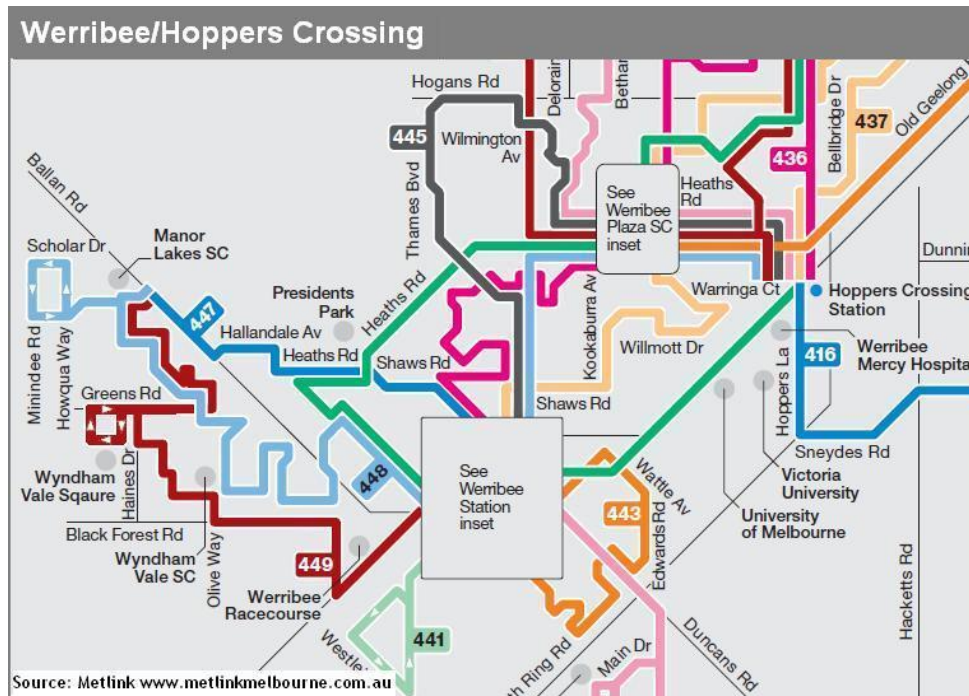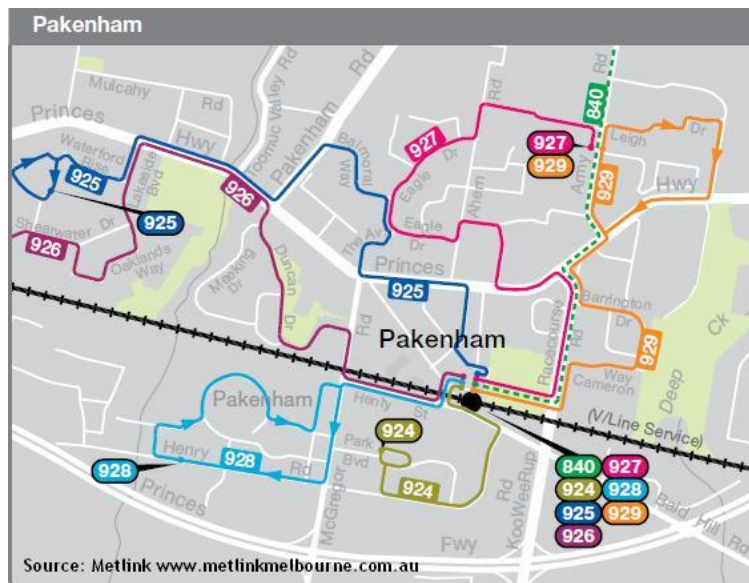**Figure One: Werribee/Hoppers Crossing local bus network**

Figure Two: Pakenham local bus network

Figure Three: Cranbourne local bus network

Werribee/Hoppers Crossing and Pakenham (Figures One and Two) feature few occasional services or deviations (marked as dotted lines). Route numbers are economically used and logically grouped. Timetables show most routes operate daily and few overlaps exist away from the major hubs. Overall these present as legible networks.

Cranbourne (Figure Three) is different. Fewer routes are full-service and more overlap and/or operate occasional deviations. New routes tended to be layered over a largely unchanged existing network. Consequently the legibility of Cranbourne's bus network has been and remains low.

Overall, review implementation has strengthened the already legible networks of Wyndham and Pakenham. However it did not help Cranbourne where legibility was needed most.

3.1.2. Timetable harmonisation with trains

The versatility of a local route increases if it connects with other train, tram and bus routes. 48% of Melbourne bus trips involve a transfer, with bus/train transfer most common (Currie and Loader 2009). Careful attention to timetabling, through integrated pulse scheduling, is necessary to exploit this 'network effect' in areas where rail frequencies are low (Nielsen and Lange 2010).

Pulse timetables require feeder buses to run at integer multiples of train frequencies. Hence if trains are every 20 minutes, buses need to be every 20, 40 or 60 minutes, with incompatible headways like 15 and 30 minutes avoided. Similarly where trains are every 30 minutes buses can run every 30 or 60 minutes but not every 20 or 40 minutes. Even without special co-ordination harmonisation also allows robust bus/bus transfers in many areas where routes cross.

Current train and approximate bus frequencies for all routes in the review areas of Wyndham (Werribee/Hoppers Crossing), Cardinia and northern Casey (Narre Warren/Berwick/Pakenham) and southern Cardinia (Cranbourne) are shown below. Numbers in brackets are the frequencies applying before review implementation (April 2010 for Wyndham, December 2010 for Cardinia/Casey).

Table One: Wyndham bus routes (Train frequency 20 min)

Route	Approx length (min)	M-F freq	Sat freq	Sun freq	Changed route?	New time-table?	Harmonised all days?
413	36	40(40)	40(40)	40(-)	no	yes	yes
416	33	40(40)	40(40)	40(-)	yes	yes	yes
436	37	40(40)	40(40)	40(60)	no	yes	yes
437	36	40(40)	40(40)	40(80)	no	yes	yes
438	-	- (40)	- (40)	- (-)	deleted	-	-
439	26 - 35	2 x 60 (80)	60 (80)	60 (-)	yes	yes	yes
440	-	- (40)	- (40)	- (60)	deleted	-	-
441	10	40(40)	40(40)	- (-)	no	yes	yes
442	30 - 33	40(40)	40(40)	40(-)	yes	yes	yes
443	27	60(40)	60(40)	60(-)	yes	yes	yes
444	37	40(40)	40(40)	40(-)	no	yes	yes
445	25	60(60)	60(60)	-	no	yes	yes
446	75	40(-)	40(-)	40(-)	new	yes	yes
447	16	40(-)	40(-)	40(-)	new	yes	yes
448	38	40(-)	40(-)	40(-)	new	yes	yes
449	30	40(-)	40(-)	40(-)	new	yes	yes

Table One notes: 1. Service frequencies are as of May 2011. 2. Figures in brackets are service frequencies that applied prior to April 2010. 3. Source: Metlink timetables.

Table Two: Cardinia and northern Casey bus routes (Train frequency 30 min weekdays/40 min weekends)

Route	Approx length (min)	M-F freq	Sat freq	Sun freq	Changed route?	New time-table?	Harmonised all days?
827/828	108	20 (20)	60 (60)	60 (60)	827 deleted	yes	no
831	14	40 (-)	60 (-)	60 (-)	new	yes	no
834	73	30 (30)	40 - 65 (45 - 75)	45 – 75 (45 - 75)	yes	yes	no
835	71	30 (30)	40 – 70 (55 - 70)	50 – 65 (55 - 70)	yes	yes	no
836	25	60 (60)	60 (60)	60 (60)	yes	yes	no
837	23	60 (40)	60 (80)	60 (-)	yes	yes	no
838	40	Occ (occ)	-	-	no	no	n/a
839	16	40 (40)	60 (80)	60 (-)	yes	yes	no
840	35	Occ (occ)	Occ (occ)	-	no	no	n/a
841	40	45 (45)	45 (45)	60 (60)	yes	yes	no
842	17	Occ (occ)	-	-	no	no	n/a
843/845/ 849/861	30	12 (12)	15 (15)	30 (30)	no	no	no
844	17 - 24	30 (30)	60 (60)	-	no	no	yes
846	18	60 (-)	60 (-)	60 (-)	new	yes	no
847	23	30 (-)	60 (-)	60 (-)	new	yes	no
924	8	60 (-)	60 (-)	60 (-)	new	yes	no
925	14	60 (-)	60 (-)	60 (-)	new	yes	no
926	45	60 (60)	60 (60)	60 (60)	no	yes	no
927	15	60 (60)	60 (60)	60 (60)	yes	yes	no
928	10	60 (60)	60 (60)	60 (60)	yes	yes	no
929	10 - 15	60 (60)	60 (60)	60 (60)	yes	yes	no

Table Two notes: 1. Service frequencies are as of May 2011. 2. Figures in brackets are service frequencies that applied prior to December 2010. 3. Source: Metlink timetables.

Table Three: Southern Casey bus routes (Train frequency 30 min weekdays/40 min weekends)

Route	Approx length (min)	M-F freq	Sat freq	Sun freq	Changed route?	New time-table?	Harmonised all days?
789/790 /791	44- 49	40 (40)	40 (40)	60 (60)	no	no	no
795/796	Varies	Occ (occ)	-	-	no	no	n/a
797	38	Occ (occ)			no	no	n/a
799	23	50 (50)	50 (50)	-	new	yes	no
891	30	40 (-)	60 (-)	60 (-)	new	yes	no
892	42	30 (30)	60 (60)	60 (60)	no	no	no
893	58	25 – 45 (25 - 45)	60 (60)	60 (60)	no	no	no
894	34	45 (75)	60 (75)	60 (-)	yes	yes	no
895	26	45 (75)	60 (75)	60 (-)	yes	yes	no
896	27	30 (30)	40 (40)	40 (40)	yes	yes	yes
897	23	30 (60)	60 (-)	60 (-)	yes	yes	no
898	16	30 (-)	60 (-)	60 (-)	new	yes	no

Table Three notes: 1. Service frequencies are as of May 2011. 2. Figures in brackets are service frequencies that applied prior to December 2010. 3. Source: Metlink timetables.

The tables show large connectivity differences between areas.

Wyndham's headways (Table One) typically harmonise seven days per week, with connections repeating every 40 minutes. In contrast most Cardinia and Casey weekend connections only repeat every 120 minutes, as hourly buses try to meet trains every 40 minutes.

Effective frequencies in Cardinia/Casey (Tables Two and Three) are thus often lower than demographically similar Wyndham. Harmonisation presents opportunities to reappraise existing trade-offs between frequency, connectivity and coverage. For example an increase in weekend buses from 60 to 40 minutes represents a 50% service increase but a 200% effective frequency rise. If resources are limited, somewhat looser coverage requirements (so that some must walk further) may be acceptable in exchange for connectivity and frequency gains.

Wyndham's train/bus timetable harmonisation existed before the bus review and has continued since. Cardinia/Casey's non-harmonised timetables also existed prior and changed little since. While review implementation increased network coverage and sometimes frequency, connectivity planning had low priority, even where limited train frequencies make it essential for the network to function.

3.1.3. Maximising effective frequencies

A frequent service is often desirable between major trip generators but funding may not exist for a dedicated frequent route, such as a SmartBus. A cost-effective solution is to co-schedule existing parallel routes to optimise frequency along the common section (Caldwell 1979, Nielsen 2005). For example, two overlapping routes, each every 40 minutes, could form a 20 minute combined service along the common section. Harmonised train frequencies, such as Werribee line services in the City of Wyndham, could further aid connectivity.

To test whether overlapping routes have been co-scheduled for maximum frequency, several multi-route corridors serving key trip generators in the City of Wyndham were examined.

Maximum waiting times and average combined frequencies were established from timetables. Weekday off-peak times between 10am and 2pm were used for the comparison in Table Four.

Where the maximum wait matched the average combined frequency (as would be the case for perfectly co-scheduled services) the average frequency/maximum wait score would be 100%. Lower percentages indicate 'lumpy' timetables of bunched services, uneven loadings and waits up to double average frequency (Caldwell 1979).

Table Four: Frequencies of selected combined route bus corridors - Wyndham

Corridor	Routes	Average combined frequency	Maximum wait	Average frequency/ Max wait ratio
Aircraft Station – Hoppers Crossing Station via Point Cook Town Centre	413, 416	20 min	39 min	51%
Hoppers Crossing Station – Werribee Plaza	413, 442, 444 anticlockwise, 445	8.5 min	20 min	45%
Werribee Station – Manor Lakes SC	447, 448, 449	13 min	28 min	48%
Hoppers Crossing Station – Tarneit	444 clockwise, 444 anticlockwise	20 min	20 min	100%

Source: Metlink timetables

Wyndham's major network strength is its harmonised bus/train frequencies. However some related bus routes appear to have been scheduled separately from one another. Separate scheduling reduces effective frequencies (and thus the attractiveness of the service to passengers) compared to if the same number of services operated but were more evenly spaced. These examples indicate that review implementation has not necessarily maximised combined frequencies and opportunities may exist for timetable reform to deliver cost-effective service gains.

4. Interplay between bus programs and the existing network

The achievements of SmartBus, MSS and the bus reviews have been discussed. Also important is the extent to which these programs relate to one other and the existing network.

For example new services may allow other routes to be straightened or rationalised to improve legibility and reduce inefficient duplication. Co-scheduling related routes increases effective frequencies and connectivity if harmonised with trains. And maintaining the integrity of planning processes when under external pressure can maximise value for money. Effective service planning allows service changes to complement one another, providing a larger network benefit than each one alone.

4.1 Interplay between SmartBus and regular route planning

The introduction of SmartBus to an area has had varying effect on local routes.   Sometimes there were no changes to existing services it overlaps.   In other cases local routes were withdrawn or modified, with resources used elsewhere.

The latter approach is more efficient, more legible and allows improvements that could otherwise not be funded. It also represents good planning practice as planners adopt network thinking techniques rather than be confined to artificial 'silos' like SmartBus and local routes.

Some instances of both approaches are presented below:

- Route 219 has two different extensions south-west of Sunshine. One operates Mondays to Saturday mornings while the other runs Saturday afternoons and Sundays only. For many years they provided the only service to the area. Later Route 471 from Sunshine gained Sunday service, making one deviation unnecessary. This was followed by the commencement of SmartBus Route 903, overlapping much of the other extension with a frequent service.   The need has passed but both extensions still run, while the nearby large Toyota plant remains without direct bus access from the local area.
- SmartBus Route 901: Large parts are overlapped by local routes. These include Route 571 between Epping and South Morang, Route 273 along Springvale Road and 280/282 in Templestowe. Similarly Route 563 overlaps a semi-rural section of Route 901 and much of Tram 86 along Plenty Road. Rationalising such duplication in low density areas may free resources for better returns elsewhere.
- SmartBus Route 901: Incorporated former Routes 830 and 831. Straightened with local service provided on upgraded Route 832 and new Route 833.   Route 544 later truncated to remove overlap.   These changes successfully separated trunk and local routes and increased span and frequency in all areas served.
- SmartBus Route 902: Incorporated former routes 888/889 and 560. Again service was straightened with local coverage provided on upgraded Route 735 and new Route 858.
- SmartBus Routes 907 and 908: While these SmartBus routes overlap between Doncaster Park & Ride and the CBD, careful co-scheduling provides a high even combined frequency that makes public transport an attractive option seven days per week.

While not exhaustive, the examples indicate varying approaches to local service planning when SmartBus was introduced. Where a network approach was taken both those on the SmartBus route and near an upgraded local service gained. In other cases overlaps risk inflating service kilometres without proportional passenger benefit. It is in these areas that potential may exist to free resources for higher gains elsewhere.

4.2 Interplay between rail and bus scheduling

Other researchers have noted that in Melbourne 'timetables are independently developed by each operator', 'no one is responsible for co-ordination across modes' (Lazanas and Stone 2010) and that schedule co-ordination is 'glossed over' (Currie and Bromley 2005). In contrast best planning practice (especially in low density areas without frequent service) requires strong co-ordinated planning for a single core frequency on primary routes (eg trains and major bus) with secondary routes (eg outer train branches and local buses) scheduled to harmonic frequencies.

Patronage statistics confirm Melbourne's difficulty in planning effective train feeder bus services. Census data showed that more Perth train commuters used train and bus than those who

arrived by car. In contrast the number of Melbourne rail passengers arriving by car outnumbered bus users by more than two to one (ABS 2006). These differences in station access methods make it worth examining the quality of connectivity planning in Melbourne and whether improvements could grow feeder bus patronage.

Table Five illustrates the main non-peak headways in force for Melbourne's train, tram and bus networks. Train frequencies are given in descending order of prevalence where they vary.

Table Five: Typical route headways for Melbourne public transport

	Metro train (Northern group)	Metro train (Clifton Hill group)	Metro train (Burnley group)	Metro train (Caulfield group)	Tram	SmartBus	Local bus (MSS)*
Weekday (interpeak)	20 10	20 40	15	15 10 30	6 - 20	15	60
Weeknight (10pm)	30	30 60	30	30 20	20	30	-
Saturday day	20	20 40	20	20 40	6 - 15	30	60
Saturday night (10pm)	30	30 60	30	30 20	20	30	-
Sunday am	40	40	30	30 40	30	30	60
Sunday day	20	20 40	20	20 40	6 -15	30	60
Sunday night (10pm)	30	40	40	30 20	30	-	-

(*) This is the minimum standard. Actual frequencies are often higher but are not always harmonised.

Source: Metlink timetables

Most apparent is the absence of a consistent core frequency applying across or even within modes, which in well-planned networks form the system's pulse and connects with harmonically scheduled feeder services. This lack of connectivity caused Lazanas and Stone (2010) to find that:

Although the SmartBus and the new Werribee rail services represent improvements to public transport, they were developed independently and opportunities for better connectivity were missed.'(p7).

Since then connectivity has deteriorated further. Most Werribee trains now skip Altona Station, severing access between the western suburbs' key growth area and its only orbital SmartBus. The Altona portion of the SmartBus also parallels local routes, likely over servicing the corridor.

Connectivity opportunities are not missed for lack of authority. Bus operator contracts allow service changes (Victorian Auditor-General 2009). The Transport Integration Act 2010 backs connectivity and authorises the Department of Transport to take necessary steps (State of Victoria 2010), including approving timetables submitted by operators (Lazanas and Stone 2010). In practice the prevalence of non-harmonised headways throughout the network appears to indicate only limited Departmental interest in connectivity planning despite its regulatory powers.

4.3 Interplay between program and non-program changes

The bus service reviews has been the program with the lowest proportion of recommendations adopted. Restructuring routes was always going to be more controversial than simply adding service to existing routes, despite potential efficiency and passenger benefits.

There is sometimes competition for resources between review implementation and ad-hoc route proposals from outside the reviews. Although not subject to the review's public consultation process they become politically important and are adopted instead of review recommendations. In other cases the review might propose the deletion of a little-used route but local pressure forces its retention (at undisclosed opportunity cost).

Two examples will be presented here.

The first is Route 280/282 'Manningham Mover' in the Doncaster area, which started in November 2008 (City of Manningham 2008). The area had lower than average public transport modal share and there had been proposals for rail lines to the area. Planned SmartBus routes had not then commenced.

Responding to council pressure, the State Government announced the new circular Manningham Mover (280/282), effectively pre-empting the bus review then under way.

The Mover received mixed local reception (Crowe 2009). It is indirect, finished early and did not run Sundays, replicating weaknesses with the current network. It replaced more direct routes and overlaps sections of SmartBus routes when these commenced later. While patronage statistics are not in the public domain, ticket validations per hour have been observed to be significantly lower than the average for Melbourne buses.

SmartBus' arrival greatly improved main road services in Manningham. However local routes remain complex with some duplication apparent. Bus reviews made little impact, with only 7 per cent of Manningham/Whitehorse/Monash recommendations adopted. Given other review successes and the Mover's low ridership, implementing more of the review instead of the Manningham Mover would have likely delivered a better network with higher patronage.

The second example is found in the semi-rural Dandenong Ranges. This area previously had a full service route between Croydon and Mt Dandenong (688) and a limited service route (698) between Mt Dandenong and Upper Ferntree Gully. Another limited service route (694) operates in the area but is almost entirely duplicated 698 and 663 with only five unique stops.

Review changes joined Routes 688 and 698, with a full service along the combined route. Route 663 was also upgraded. The review found little use of Route 694 in its unique area and recommended deletion. However political pressure prevented this and as a result resources are not available to upgrade services elsewhere (Parliament of Victoria 2010).

Both examples illustrate that despite significant public input and use of professional expertise, review implementation is susceptible to political pressure. This can cause decisions that do not maximise overall service and incur undisclosed opportunity costs. Such pressures are likely higher in cities without strong service planning cultures or planners prepared to argue their case publicly.

5. Bus service reform and patronage

Melbourne's public transport patronage has risen strongly in the last decade across all three modes (DoT 2008, BITRE 2009). Buses were slowest to rise, with boarding numbers static between 1987 and 2005 (DoT 2008). However patronage grew by over seven per cent in 2006-07 and again in 2007-08 (BITRE 2009). Growth in the three years to 2008-09 was 26 per cent, with the number of timetabled service kilometres 25 per cent higher (BusVic 2009).

The achieved patronage to service elasticity of 1 compares well with elsewhere. Currie and Wallis 2008 (page 2) cite an initial figure of 0.35 that approximately doubles long term. However even an elasticity of 1 is insufficient to deliver the higher occupancies buses need to maximise their social benefits and reduce per-passenger costs to the community.

Melbourne bus occupancies, as measured by boardings per kilometre, are lower than that of other Australian capitals (BITRE 2009 p10). The use of trams on major corridors may skew interstate comparisons. Nevertheless higher occupancies should still be possible given their current underperformance in roles such as providing effective rail feeders.

Areas where bus review implementation delivered route as well as timetable reform had higher than average increases. Routes in suburban Newport, Yarraville and Altona North used to be complex, operate over limited hours and terminate short of major trip generators. Major review changes simplified the network and delivered a patronage elasticity of 1.25 within six months (BusVic 2009). Similar simplification in Thomastown/Lalor also produced gains, with patronage rising by more than 50 per cent (Boyle 2010).

Perth reformed local bus services but on a larger scale than Melbourne. Revised Transperth timetables often include simpler routes, harmonised bus with train times and frequent service corridors from related routes. Patronage and occupancy reflect this attention to service planning; between 1999 and 2009 a 27 per cent increase in bus service kilometres produced a 43 per cent patronage growth, or an elasticity of 1.5 (Department of Transport WA 2011).

Given Melbourne's low bus occupancy, potential to grow rail feeder use and the existence of duplicating routes, experience both here and elsewhere demonstrate considerable opportunities for good bus service planning to increasing both patronage and occupancy.

6. Conclusion

Melbourne has seen significant bus service reform in the last five years.

There has been unprecedented growth of bus services in Melbourne suburbs; seven day, early evening and public holiday running is now widespread. New routes extended coverage of outer growth areas. And previously impossible trips can now be made by bus. Minimum standards upgrades and SmartBus were the two strong 'quantity of service' programs responsible for most of this increase. The number of passenger boardings is now at 40 year highs.

In contrast, service planning quality advanced slower than service quantity. Evidence of this includes the limited implementation of bus service reviews and a reluctance to apply network planning principles such as simpler routes, harmonised timetables and frequent corridors. Hence Cranbourne's network remains illegible, weekend buses in Cardinia don't mesh with trains and opportunities to schedule frequent corridors from existing routes were missed in Wyndham.

Melbourne's experience has shown that basic span and frequency improvements to largely unchanged routes may grow patronage but not by enough to increase per bus boardings. In contrast success was higher where routes were reformed, with both patronage and occupancy gains recorded.

The implications for service planning are twofold. Firstly, routes cannot be separated from scheduling; simply adding trips to an inefficient network is unlikely to produce the same occupancy gains as simultaneously revising routes and harmonising timetables. Secondly, even where funding is limited, finding offsetting savings by rationalising inefficient routes may still allow network improvements and deliver an overall community benefit. Attention to both by service planners is desirable if buses are to reach their full potential in tomorrow's public transport network.

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