

Investigating a CBD-wide carpooling scheme for Melbourne

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1 Introduction

Carpooling, also known as ride sharing, can be defined as where two or more people travel together in a car. Carpooling can be well suited for work trips as there is a major movement of people from home locations to common work locations and vice versa, over relatively confined time periods. However, it is more regularly carried out on an informal basis with family and friends for other types of trips (Paterson, 2004).

Formal carpooling schemes tend to be site-based in that they focus on a single workplace as the destination, with staff commuting from multiple origins (i.e. their home locations). Participants can then be matched up with others from similar origins so that they can travel to the same destination (the workplace) together. Such schemes work well when the number of employees at the organisation is high, there are staff travelling long distances to get to work, and the initial mode share for car driver trips at the organisation is high (DeGruyter, Rao & Meiklejohn, 2005).

However, site-based schemes can become less successful when there are other travel alternatives available (i.e. public transport), there are lower numbers of staff at the organisation, there are staff who are not paying for the use of their vehicle, and where the initial mode share for car driver trips at the organisation is low. Such is the case for many employers in the Melbourne Central Business District (CBD), which is well serviced by public transport and has only 15 employers with over 1,500 staff (City of Melbourne, 2005).

Furthermore, since Paterson (2004) recommends that only employers with more than 500 staff have their own site-based carpooling schemes, the prospects for site-based schemes in the CBD would be limited when considering that 98.8 percent of employers in the CBD have less than 500 staff (City of Melbourne, 2004).

An alternative to site-based schemes is to adopt an area-wide approach that brings all CBD employers collectively together, such that there is still one destination (the Melbourne CBD), but many more origins (home locations of all staff that work in the CBD) and therefore a greater chance of successful matching of potential carpoolers. A research project was carried out to investigate such a CBD-wide approach.

This paper is structured as follows: section 3 provides an overview of the literature on area-wide carpooling schemes, section 4 presents the major findings of the quantitative research conducted (analysis of travel survey data) and section 5 presents the major findings of the qualitative research conducted (focus groups with CBD employees). Section 6 then looks at the likely uptake levels and (dis)benefits of a CBD-wide carpooling scheme for Melbourne, with conclusions and future research directions being presented in section 7.

2 Literature review

A literature review was carried out to investigate the following:

1. Internal and external factors that make carpooling schemes successful.
2. Factors that motivate people to register for carpooling.
3. Delivery options available for area-wide carpooling schemes.
4. Liability implications of carpooling schemes.

5. Concerns/constraints common to individuals registering for carpooling.
6. Potential disadvantages of carpooling schemes.

The following is a summary of the findings of the literature review.

2.1 Internal and external factors that make carpooling schemes successful

Internal factors (those that are internally specific to carpooling schemes) most commonly mentioned in the literature that make carpooling schemes successful included:

1. Marketing and promotion of the scheme.
2. Support from senior management.
3. Reimbursement of parking charges for carpoolers.
4. Provision of priority parking for carpoolers.
5. Efficient management of the carpooling scheme through a dedicated coordinator.

External factors (those that are likely to occur regardless of whether a carpooling scheme is set up) most commonly mentioned in the literature included:

1. Presence of High Occupancy Vehicle (HOV) lanes.
2. Lack of parking.
3. Absence of convenient alternative modes.
4. Increase in petrol price.
5. Having the carpooling scheme as part of a wider package of initiatives.

It is therefore important to ensure that the internal factors mentioned above are incorporated into the design of any carpooling scheme to ensure a greater level of success. It is also important to recognise the existence of any external factors that may impact on the success of a carpooling scheme, and to ensure that the scheme takes full advantage of these external factors, where possible.

2.2 Factors that motivate people to register for carpooling

Understanding the personal motivations to carpooling can greatly assist in steering carpooling schemes towards success. For example, promotional efforts can be much better targeted when the motivation for carpooling is known, as will other aspects of a carpooling scheme such as the provision of incentives. Motivational factors most commonly mentioned in the literature included:

1. To save money.
2. To help the environment.
3. Presence of parking restrictions or a lack of parking.
4. To reduce traffic congestion.
5. Presence of priority parking.

Whilst helping the environment was seen as a common motivation to carpool, this should be treated with caution since it is ‘socially unpopular’ to not state that one is helping the environment by carpooling. Indeed, it is possible that helping the environment has little or no impact on people’s motivations to carpool (Stevens, 1990). This is consistent with findings by Ledbury (2005) who states “only a small proportion of target audiences would ‘buy into’ the environmental and social benefits; the main motivation for people to car share will be personal financial gain.”

2.3 Delivery options available for area-wide carpooling schemes

Transportation Management Associations (TMAs) are cited as a common option for the delivery of area-wide carpooling schemes in the US (Victoria Transport Policy Institute, 2005; Loudon, Luther, Mabry & Kavage, 2002; Sweetland, 1993). TMAs involve both public and private sector groups working together to deal with transport issues and problems in particular areas. Sweetland (1993) supports this delivery option because “by pooling employee numbers and resources, greater participation in carpooling and other travel demand management initiatives can be achieved”.

The Victoria Transport Policy Institute (2005) rated the appropriateness of different options for the delivery of area-wide carpooling schemes. This is summarised in Table 1.

Table 1 Appropriateness of delivery options available

Delivery option	Rating
Local government	Very appropriate
Transportation Management Association (TMA)	Very appropriate
State government	Appropriate
Individual employer/s	Appropriate
Federal government	Not very appropriate
Developer	Not very appropriate
Neighbourhood association	Not very appropriate

Source: Victoria Transport Policy Institute (2005)

The preference for the delivery of area-wide carpooling schemes appears to be local government and/or TMAs. This could be due to local government being an authority that participants are likely to trust (as opposed to a private entity for example) with the ability to impose regulation (such as parking restrictions) that could increase the level of success of the carpooling scheme. It could also be due to TMAs having very close relationships with potential carpooling participants (usually staff of the employers themselves) and having the ability to conduct promotion of the scheme at the participant level.

2.4 Liability implications of carpooling schemes

At the individual level, carpooling is permitted under the Transport Act 1983 where the arrangement is:

1. Incidental to the main purpose of the journey (where the journey would be made irrespective of the carpooling arrangement).
2. Not the result of touting for passengers by the driver or any other person (the carpooling driver cannot operate under the same conditions as a taxi driver).
3. Limited to a maximum of seven passengers in any one vehicle.
4. Made either by using one car and sharing expenses (provided this does not involve profit to the driver or any other person) or rotating vehicles so that no money changes hands.

Individual insurance policies will also not be affected if the carpooling arrangement meets the above conditions (Sweetland, 1993). Liability implications at the individual level can be therefore overcome quite easily.

Fortunately, at the employer/carpooling service provider level, the situation is not much different. Circumstances where an employer/carpooling service provider will not be liable include (Transit Cooperative Research Program, 1994; Macdonald, 2005):

1. Where only contact details are provided to employees of other employees that have similar commute routes and times.
2. Where any record keeping is only for statistical purposes such as measuring success.
3. Where employee consent has been obtained for passing on contact details (and where only a record is kept of those that have expressed interest, not whether they have actually participated in carpooling).
4. Where no charge is made for accessing the information or registering interest.
5. Where participation in carpooling is voluntary.

The design and operation of any carpooling scheme should therefore take the above into account, and ensure that any potential for liability is substantially reduced for the parties involved. Finally, the promotion of any carpooling scheme should advise participants of the precautionary measures they can take to avoid any liability implications.

2.5 Concerns/constraints common to individuals registering for carpooling

Understanding the concerns and constraints of individuals in relation to carpooling can assist in shaping a successful carpooling scheme. For example, if potentially having to carpool with a smoker was recognised as a common concern, efforts could be directed towards ensuring that this is catered for in the registration process by including a smoking/non-smoking preference in the criteria used for matching up participants.

Concerns/constraints most commonly mentioned in the literature are shown in Table 2 (from most common to least common) with possible solutions to overcoming them (Department for Transport, 2004).

Table 2 Concerns/constraints related to carpooling and possible solutions

Concern/constraint	Possible solution
Fear of travelling with strangers	Hold postcode lunches in workplace Use case studies with photos of participants Suggest trial period before committing to an arrangement
Reduced flexibility in working hours	Stress that participants do not have to carpool everyday Provide a guaranteed ride home program Focus on the benefits of carpooling, particularly financial, together with any incentives provided for carpoolers
Uncertainty over legal liability or insurance implications	Reassure potential participants through promotional material Outline potential liability/insurance implications to participants Use disclaimers as appropriate
Having to be reliant on others	Provide guidance in promotional material on setting up successful carpooling arrangements Provide a guaranteed ride home program
Loss of privacy	Explain how any information collected will be handled Collect information only necessary to carpool matching

2.6 Potential disadvantages of carpooling schemes

The concerns and constraints discussed previously in section 2.5 could be considered disadvantages from a carpooling participant's point of view. The following will therefore look outside the scope of the carpooling participant and consider other types (namely external) disadvantages that are likely to emerge from the implementation of a carpooling scheme.

The most common potential disadvantages of carpooling schemes mentioned in the literature included:

1. People switching from public transport to carpooling, thereby reducing public transport patronage.
2. Additional travel time spent picking up and dropping off carpooling partners.
3. Use of car by other household members during the day.

Public transport operators may consider carpooling as competition that can potentially reduce patronage. For example, in the early 1970s, express lanes were made available to carpoolers in North Virginia, resulting in 30 percent of the people carpooling being actually previous bus users (Ritchie & Richardson, 1979). Furthermore, during the early 1990s in Melbourne, around six percent of carpoolers using a new transit lane were previous public transport users (Sweetland, 1993). However, reduced patronage on public transport may be in fact beneficial if services are over capacity during peak times, since capacity could be 'freed' up which would otherwise be very expensive to provide (Cairns, Sloman, Newson, Anable, Kirkbride & Goodwin, 2004; Rose, 2006).

Whilst it is likely that additional travel time will be associated with picking up and dropping off carpool partners (Victoria Transport Policy Institute, 2005; Sweetland, 1993), there will still be a reduction in Vehicle Kilometres Travelled (VKT) by the carpooling group overall. This is because every member of the carpooling group will not be making the full journey that they would have made before when they were driving alone. Despite this, it is still important to recognise that the need to make detours to meet carpoolers may be a potential constraint, resulting in some people being deterred from carpooling.

Cairns et al (2004) reports that there is potential for a greater use of cars that have been left at home by other household members. However, the scale of this has shown to be relatively small at an extra 10km per week per family (*ibid.*), meaning that it is highly likely that there would still be an overall reduction in VKT.

3 Quantitative research: insight from survey responses

The Victorian Department of Infrastructure, through its TravelSmart program, has been working with employers in Melbourne's CBD to develop and implement green transport plans. As part of this process, a staff travel survey is first conducted so that staff travel patterns can be determined. During 2005, a total of 24 employers (comprising 6,551 staff) were surveyed. Of this, a response rate of approximately 38 percent (or 2,501 staff) was achieved.

Responses were aggregated and weighted appropriately across the sample population. They were also segmented by job classification category (high = senior manager/executive, medium = team leader/specialist, low = administration/junior), gender, age, and whether respondents had a car or parking included as part of their salary package.

3.1 Mode shares

Staff were asked what mode of transport they used to travel to work. If they used more than one mode of transport, the mode used for the longest (distance) part of the journey was to be stated. As can be seen from Figure 1, less than 20 percent of respondents stated that they drove alone to work, with less than eight percent carpooling. Therefore, site-based carpooling schemes in the CBD are likely to be unsuccessful since on average, there is a relatively low proportion of staff driving to work alone in each workplace. A CBD-wide scheme could overcome this problem by 'pooling' numbers across all workplaces.

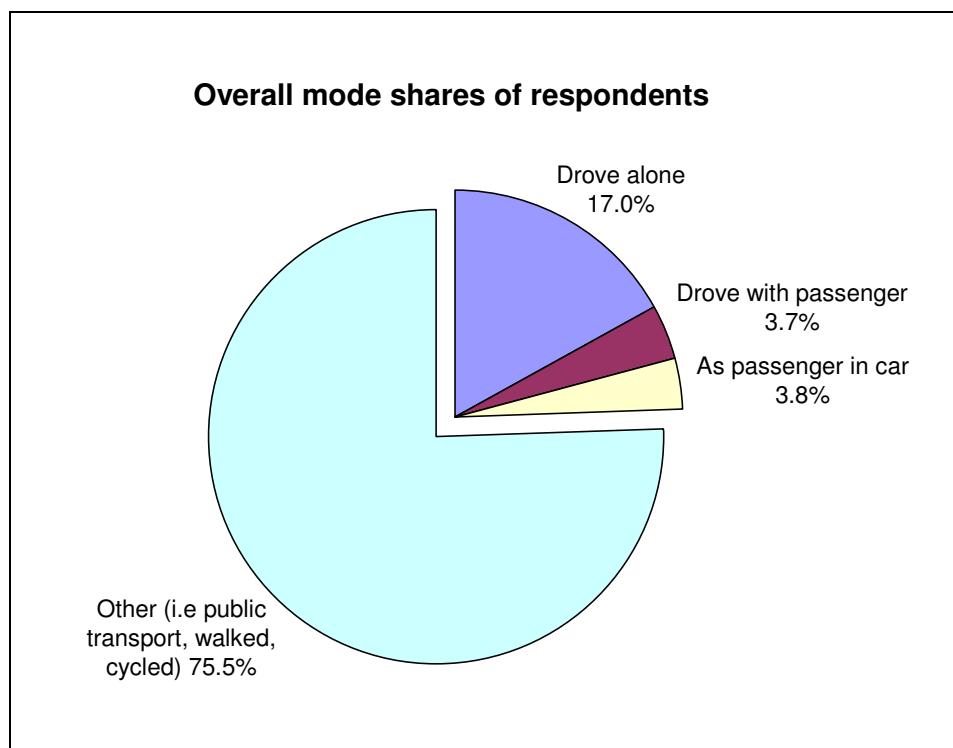


Figure 1 Mode shares of respondents for the journey to work to the Melbourne CBD

Major findings from the segmentation analysis include:

1. Of those who drove to work alone, around half (49.9 percent) were in the high job classification category and around one-third (31.4 percent) were in the low job classification category.
2. A greater proportion of males drove to work alone (56.0 percent) and drove with a passenger (63.6 percent) than females, but less travelled as a passenger in a car (31.5 percent).
3. Only around one-quarter (26.9 percent) of staff that drove to work alone had a car as part of their salary package, and only around one-third (31.3 percent) had parking as part of their package.

3.2 Level of interest in a CBD-wide carpooling scheme

Staff were asked whether they would be interested in registering for a CBD-wide carpooling scheme if it was made available. As can be seen from Figure 2, around six percent of respondents stated that they would be *very interested* in registering and around 23 percent said they would be *slightly interested*. The potential for an effective area-wide carpooling

scheme to exist can then be recognised when considering there are over 200,000 staff working in the CBD (City of Melbourne, 2004).

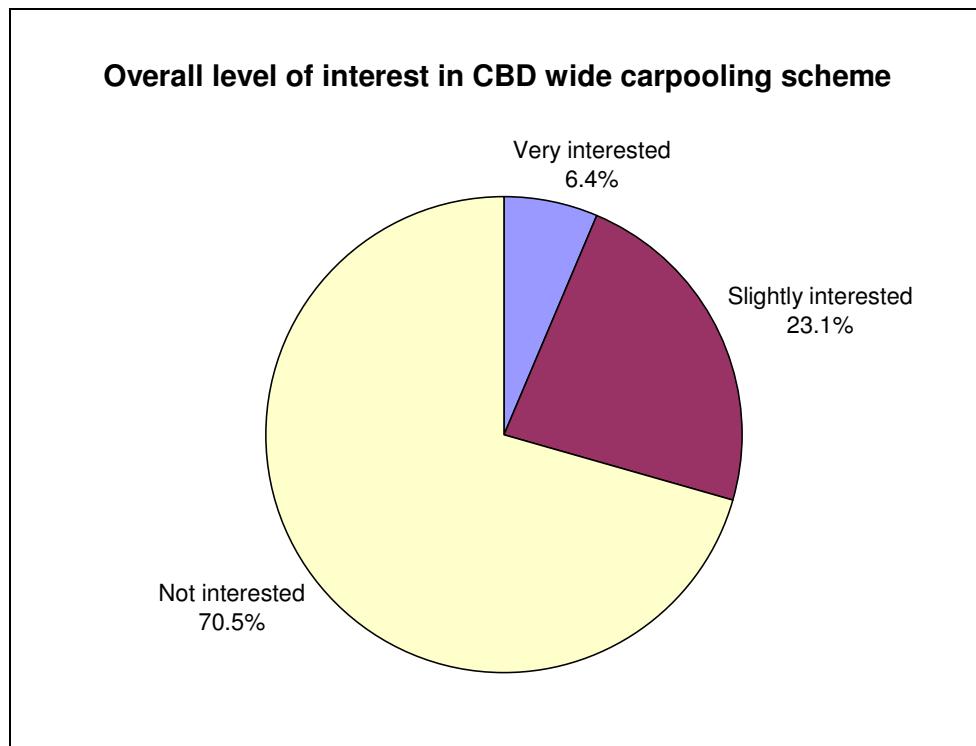


Figure 2 Level of interest in CBD-wide carpooling scheme

Findings from the segmentation analysis include:

1. Almost half of the respondents (42.4 percent) who stated they would be *very interested* were in the low job classification category. Only 22.5 percent that were *very interested* were in the high job classification category. A similar pattern emerged for those that were *slightly interested*.
2. A higher proportion of females were *very interested* (55.0 percent) and *slightly interested* (50.5 percent) than males.
3. Surprisingly, of those that stated they would be *very interested*, 6.5 percent had parking as part of their package.

However, the most important finding from the segmentation analysis (and the research project overall) was that related to the mode of transport that the *very interested* and *slightly interested* groups used to travel to work. It was initially assumed that those who stated that they were interested in registering for a CBD-wide carpooling scheme would be currently driving alone or carpooling to work. However, as Figure 3 shows, the clear majority (around 64 percent) are actually public transport users and a much smaller proportion (around 26 percent) drive or carpool. This may suggest that some staff working in the CBD would prefer to travel by car to work, if the cost of doing so was lower. It may also suggest some degree of dissatisfaction with current radial public transport services in Melbourne.

If a CBD-wide carpooling scheme was to be implemented in Melbourne, the likely result would be an overall increase in VKT (since more car trips would be made) and a reduction in public transport patronage (people switching from public transport to carpooling). Taken at face value, a CBD-wide carpooling scheme for Melbourne would appear unfeasible. However, such a scheme may have the advantage of improving accessibility into the CBD and freeing up capacity on the public transport network that would otherwise be very

expensive to provide. The (dis)benefits of a CBD-wide carpooling scheme are discussed further in section 5.2 of this paper.

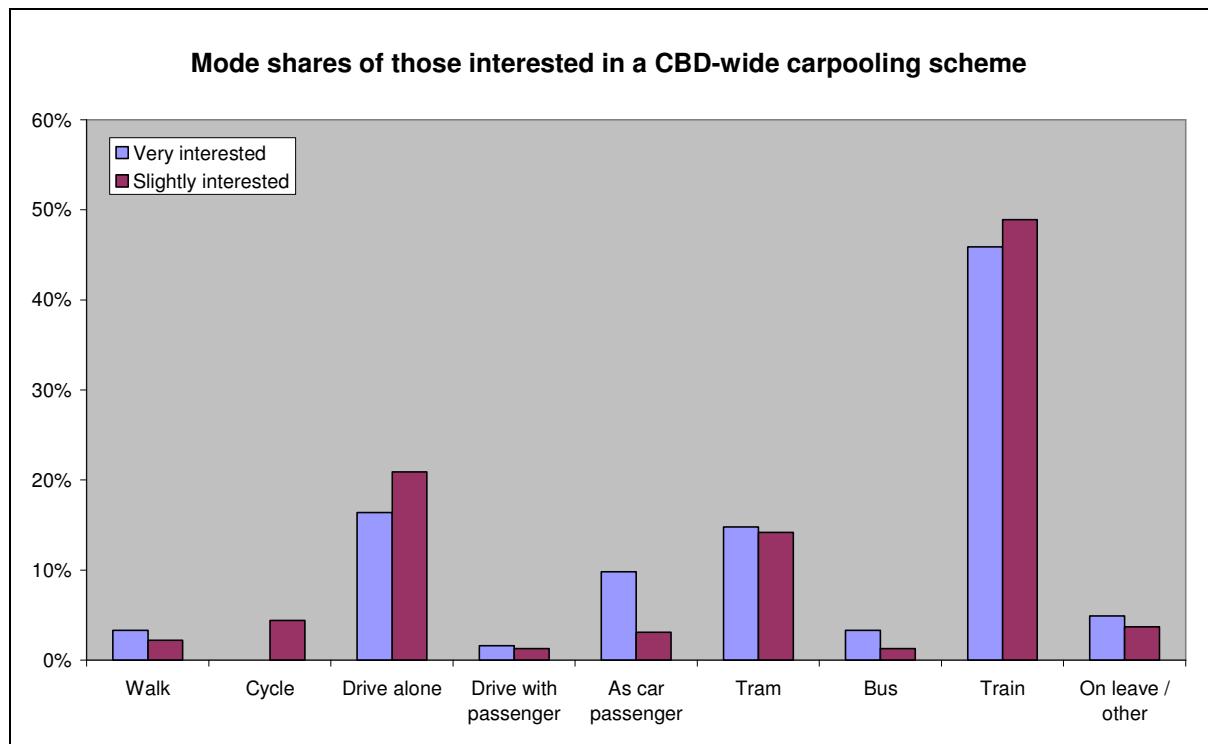


Figure 3 Mode shares of those interested in a CBD-wide carpooling scheme

3.3 Geocoding of respondents' home locations

Staff were asked of their home suburb and postcode, which was then geocoded and thematically mapped by questions asked in the survey. Major findings included:

1. A high proportion of staff that drove to work alone live in the wealthier inner south eastern suburbs of Melbourne, such as Brighton, Elwood and Prahran.
2. Conversely, a high proportion of staff that carpooled to work live in the less affluent western suburbs of Melbourne, such as Hoppers Crossing and Sunshine. Staff from these suburbs were also most interested in registering for a CBD-wide carpooling scheme. Promotional efforts targeting staff living in those suburbs may therefore be beneficial.
3. Most staff interested in registering for a CBD-wide carpooling scheme live within a 15 km radius of the CBD. This may therefore limit the potential of a CBD-wide carpooling scheme, as participants may be reluctant to make detours to pick up passengers since they are not very far from their destination (the CBD). However, given a larger sample size, the radius may in fact be higher.

4 Qualitative research: insight from focus groups

In order to gain an understanding of individual attitudes towards carpooling, a focus group session was held in February 2006 with 12 staff that work in the Melbourne CBD. These staff represented a mix of people in terms of their main commuting mode (driving, carpooling, public transport, etc), job classification (senior manager, team leader, officer, administration, etc) and gender.

The focus group session comprised of five main discussion topics including:

1. Perceived benefits of carpooling.
2. Perceived barriers to carpooling.
3. Incentives that may encourage carpooling.
4. Preferred methods of registration for a CBD-wide carpooling scheme.
5. Suggestions for encouraging carpooling to work.

The following presents a summary of the findings of the focus group session.

4.1 Perceived benefits of carpooling

It is important to understand the types of benefits that people associate with carpooling as these can then be promoted to potential carpoolers as much as possible to increase the number of people registering for carpooling and ultimately carpooling as a result.

Benefits that were mentioned by all three groups included:

1. Reduced traffic congestion and associated benefits (reduced air pollution, “*more reliable trams*”, and more efficient use of resources).
2. Reduced individual car costs such as petrol and parking (“*used to live in Geelong and would have loved to carpool*”).
3. Increased social interaction (“*way to meet people*”).

Other benefits that were mentioned included:

1. Greater level of comfort if having to carry equipment.
2. Greater level of reliability (if previously using public transport).
3. Improved public transport service (through reduced crowding, etc).
4. Improved journey times if able to carpool to train station since “*connecting bus to train is difficult*”.
5. Increased transport accessibility (for those not “*on doorstep to public transport*” or those that don’t have a car).

4.2 Perceived barriers to carpooling

The main barrier to carpooling that was discussed by focus group participants was that of a perceived lack of flexibility. One participant mentioned that “*getting in at the same time is fine but what about leaving at the same time*” with another saying a barrier was “*not being able to leave when you’re ready*”. It was perceived that this barrier impacts “*especially for people with children*” and that “*if you have to take a day off, you have to organise it in advance*”.

Other common barriers to carpooling that were mentioned included:

1. Personal safety (“*for women*” and “*stranger danger*”).
2. Not wanting to talk in the morning.
3. Having to rely on others (“*worrying about punctuality*”).
4. Having a car and/or parking salary packaged (“*on a novated lease with work therefore must drive to work to get up to 15,000km every year*”).
5. Already being content with using public transport (“*don’t think carpooling will ever be attractive to the city because public transport is so convenient*”).

4.3 Incentives that may encourage carpooling

Providing the correct incentives for people to carpool has, in most cases, proven to increase carpooling uptake levels (Forbes, 2005). Therefore, by knowing which incentives are preferred by employees working in the CBD, a more effective carpooling scheme can emerge.

The most common incentive that was mentioned by participants was that of priority parking (“*at bottom of car park and close to the entrance/exit*”). Other incentives commonly mentioned by included:

1. Subsidised parking costs (“*cheaper parking*”).
2. Provision of High Occupancy Vehicle (HOV) lanes for congested areas on freeways.
3. Providing a rewards scheme (“*reward like fly buys*”).

Employers could therefore play a major role in encouraging carpooling through the provision of subsidised parking in priority spots, holding events to encourage potential carpoolers to meet, and by providing discount vouchers to those that carpool. State and local governments could also assist through the provision of HOV lanes and the establishment of a rewards scheme for example.

4.4 Preferred methods of registration for a CBD-wide scheme

The main registration method preferred by focus group participants was to informally meet potential carpoolers in person, i.e. over “*coffee, before committing to carpooling*”. Other methods that were popular amongst participants included internet (“*registration like RSVP.com where you have a profile, interests and photo*”) and email/phone (“*for last minute changes you'll call/email your carpool person if you're late*”).

It was also mentioned that there is a need to incorporate preferences in the matching process. These could include only being matched up with people in your building (“*only matching within your defined community*”), as well as incorporating smoking and gender preferences.

Any development of a CBD-wide carpooling scheme could therefore benefit from encouraging people to meet before committing to any carpooling arrangement, in conjunction with providing an internet-based matching service that incorporates personal preferences.

4.5 Suggestions for encouraging carpooling to work

Participants suggested the following ideas for encouraging carpooling to work:

1. Have rules on how to share travel costs in the form of a tool (i.e. a calculator) as well as ground rules for behaviour.
2. Use an e-bay type rating system for carpoolers (i.e. safe driving rating, etc).
3. Use a combination of car sharing and carpooling, so that no one actually owns the car but each member of the carpool contributes to expenses.
4. Suggest that people “*Don't have to pool everyday of the week, just one day a week*”.
5. Establish a ruling body that operates the carpooling scheme, takes complaints, monitors usage, and organises days for everyone from particular suburbs interested in carpooling to meet.

5 Uptake levels and (dis)benefits of a CBD-wide carpooling scheme

5.1 Estimation of uptake levels

The first step in estimating uptake levels involves determining what proportion of staff will be exposed to the scheme. An effective promotional campaign would ultimately expose the scheme to a high proportion of staff through a variety of mediums such as radio, newspaper, workplace seminars and email. However, in order to be conservative, it has been assumed that the scheme would be exposed to only one-third of staff that work in the CBD. Table 3 shows that this works out to be around 72,000 staff.

Table 3 Assumed exposure of CBD-wide carpooling scheme

Total number of staff working in CBD	215,724 (City of Melbourne, 2004)
Assumed proportion of staff exposed to scheme	33.3%
Total number of staff exposed to scheme	71,908 ($= 215724 \times 0.333$)

From this, the likely uptake levels of the scheme can then be calculated. This is done through using the results of the quantitative research (section 3.2) that show the proportion of staff that would be *slightly interested* and *very interested* in registering for a CBD-wide carpooling scheme, if it was made available. Also, an assumed successful matching rate is used which is defined as the proportion of staff registering that are matched up successfully and are actively carpooling as a result. It is also assumed that the successful matching rate is higher for those staff who stated they were *very interested* since these staff would be more willing to make the carpooling arrangement work. Table 4 shows that the likely uptake of active carpoolers resulting from the scheme could be around 9,000 staff (sum of the *very interested* and *slightly interested* groups).

Table 4 Estimation of number of active carpoolers

	Very interested	Slightly interested
Proportion of staff in CBD	6.4%	23.1%
Number of staff in CBD	4,602 ($= 0.064 \times 71908$)	16,611 ($= 0.231 \times 71908$)
Assumed matching rate	50%	40%
Number of active carpoolers	2,301 ($= 0.50 \times 4602$)	6,644 ($= 0.40 \times 16611$)

5.2 (Dis)benefits accruing from the scheme

As discussed in section 3.2, a CBD-wide carpooling scheme in Melbourne is likely to result in an increase in VKT and decrease in public transport patronage since the majority of those interested in registering for such a scheme are current public transport users. Hence, such a situation is likely to result in an increase in:

1. Private vehicle operating costs.
2. Traffic congestion.
3. Vehicle accidents.
4. Water pollution (runoff from roads).
5. Air pollution.
6. Greenhouse gas emissions.
7. Noise pollution.

Another “disbenefit” of implementing an area-wide carpooling scheme for Melbourne’s CBD would of course include the costs of establishment and implementation, covering aspects such as promotion and provision of incentives, software and administration.

However, as also mentioned previously, a CBD-wide carpooling scheme may have some merit in increasing accessibility to the CBD (particularly for those in outer areas without access to public transport) and freeing up capacity on the public transport network that would be otherwise very expensive to provide. Other benefits worthy of consideration include:

1. Greater social interaction amongst carpooling participants.
2. Increased staff retention due to an improvement in accessibility to the workplace.
3. Reduced costs to employers associated with the provision of parking.
4. Reduced stress for carpooling participants due to not having to drive all the time.
5. Reduced travel time for some participants (i.e. those using other modes previously).
6. Enhanced employer image.

Finally, Sweetland (1993) states that the intangible benefits of improved corporate and staff image, reduced employee absenteeism and tardiness often prevail over the tangible benefits of decreased demand for parking facilities as a result of carpools being formed.

6 Conclusions and future research directions

This research project has developed an understanding of carpooling scheme success factors (both internal and external), as well as the personal motivations, concerns, and constraints associated with carpooling. It has investigated the different delivery options available for area-wide carpooling schemes, as well as the liability implications of carpooling schemes. The disadvantages of carpooling schemes, namely the potential to reduce public transport patronage, have also been explored.

A detailed analysis of travel survey data has determined the types of people who drive to work to the CBD. The analysis has also looked at the level of interest of a CBD-wide carpooling scheme, showing that around six percent of respondents would be *very interested* and around 23 percent would be *slightly interested* in registering for such a scheme. However, of these interested staff, the majority currently use public transport to travel to work meaning that such a scheme could result in an overall increase in VKT and reduction in public transport patronage.

The conduct of focus groups provided valuable insight into the perceived benefits and barriers to carpooling, showing that reduced traffic congestion and individual car costs are the main benefits, with a perceived lack of flexibility being the main barrier to carpooling. Preferred incentives (priority parking being the most popular) and registration methods (informally meeting in person) common to current and potential carpoolers were also explored.

By applying conservative assumptions, this paper has also estimated a likely uptake level of around 9,000 staff for a Melbourne CBD-wide carpooling scheme. “Disbenefits” have been discussed which result from an increase in VKT, with benefits from such a scheme being more likely to be of a qualitative nature.

Future research relating to area-wide carpooling schemes should aim to:

1. Undertake a study into potential locations in Melbourne (i.e. business parks) and other Australian cities that would be more suitable for the establishment of area-wide carpooling schemes.

2. Investigate the effect of carpooling schemes and related incentives (i.e. HOV lanes) on public transport patronage, and in particular, whether this results in an overall benefit from 'freed-up' capacity.
3. Understand in more detail the cost effectiveness of carpooling relative to other measures, in terms of the financial benefit per reduction in VKT.
4. Evaluate the relative effectiveness of different internal and external carpooling success factors, in terms of their ability to achieve a modal shift towards carpooling.

7 Acknowledgments

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8 References

- Cairns S, Sloman L, Newson C, Anable J, Kirkbride A & Goodwin P (2004). Smarter Choices – Changing the Way We Travel. Final Report to the Department for Transport, London, UK. Chapter 9 – Car sharing schemes. [Online] Available at: www.dft.gov.uk. Accessed on 15 December 2005.
- City of Melbourne (2004). CLUE 2004 – Census of Land Use and Employment. City of Melbourne, Victoria, Australia. [Online] Available at: www.melbourne.vic.gov.au/clue. Accessed on 15 December 2005.
- City of Melbourne (2005). Email communication with Census of Land Use and Employment (CLUE) representative, City of Melbourne. Victoria, Australia.
- DeGruyter C, Rao D & Meiklejohn D (2005). Tools for Travel Behaviour Change. Presented at the 28th Australasian Transport Research Forum. Sydney, Australia.
- Department for Transport (2004). Making Car Sharing and Car Clubs Work – A Good Practice Guide. Final V1.0. pp. 1-19. UK. [Online] Available at: www.dft.gov.uk. Accessed on 15 December 2005.
- Forbes A (2005). Private communication with Director of Operations, NuRide. U.S.
- Ledbury M (2005). Overcoming the barriers: how to steer car sharing schemes into a successful future, in Local Transport Today, News Extra 17 February 2005. pg. 13. UK.
- Loudon W, Luther D, Mabry J & Kavage S (2002). Assessing the Effectiveness of TDM and Land Use Strategies for a Corridor Study in the Puget Sound Region, in TRB 2003 Annual Meeting CD-ROM. DKS Associates, Oakland, Canada.
- Macdonald K (2005). Private communication with Manager Legal Services, Executive & Legal Branch, Corporate Resources Division, Department of Infrastructure. Victoria, Australia.
- Paterson D (2004). Car pooling – targeting for success, presented at the 27th Australasian Transport Research Forum. Adelaide, Australia.
- Ritchie S & Richardson A (1979). On the Demand Implications of Priority Lanes. Department of Civil Engineering, Monash University. Victoria, Australia.

Rose G (2006). Email communication with Director of Institute of Transport Studies, Associate Professor Geoff Rose. Department of Civil Engineering, Monash University. Victoria, Australia.

Stevens W (1990). Improving the Effectiveness of Ridesharing Programs, in Transportation Quarterly, Vol. 44, No. 4. Eno Foundation for Transportation Inc. Westport, Connecticut. pp. 563-578.

Sweetland M (1993). Car Pooling Schemes. Research Report ARR No. 240. Australian Road Research Board Ltd. Victoria, Australia.

Transit Cooperative Research Program (1994). Successful Risk Management for Rideshare and Carpool-Matching Programs, in Legal Research Digest. Transportation Research Board, National Research Council.

Victoria Transport Policy Institute (2005). TDM Encyclopedia - Ridesharing. Victoria, Canada. [Online] Available at: www.vtpi.org/tdm/tdm34.htm. Accessed on 15 December 2005.